AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

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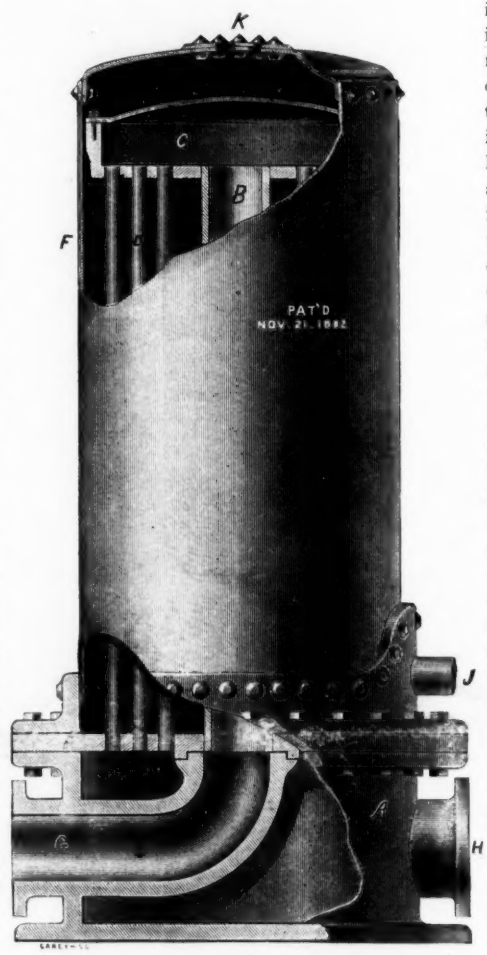
ENTERED AT POST OFFICE, NEW YORK, AS SECOND CLASS MATTER.

Miles' Feed-water Heater.

The feed-water heater, illustrated herewith, is made by George Miles, South Boston, Mass. The construction, it is claimed, is such as to insure heating the water to the highest attainable point by the use of exhaust steam. The base is cast with the inlet and outlet for steam, the inlet pipe making a quarter turn as shown, the whole forming part of the base casting. The upper end of the inlet pipe connects with tube plate or enlarged pipe in center of heater. Around this center pipe are set in radial rows series of 1″ copper tubes, connecting the bottom tube plate with a supplementary or expansion head. The tubes are set in each head the same as boiler tubes, with roller expander. The supplementary tube head has a cover secured with composition tap bolts, thus making a circuit for the exhaust steam. The steam enters the inlet at base, passing through, and upward through enlarged center tube of copper into the supplementary head, distributing and passing down the smaller tubes into the base and out at outlet. It will be seen by this construction that no injury or leakage will occur by contraction or expansion. The jacket or shell of heater is made of steel, with cast-iron flange to bolt to base. The inlet for feed water is about one foot from base ring of jacket, and the outlet is from center at the top. The water fills the enclosed space of shell, and is heated by contact with the tubes, and as it becomes heated it ascends to the top of heater, absorbing heat in its ascent. It will be seen that the steam entering and ascending quickly to supplementary head reaches that point at high temperature, imparting to the feed water at its highest point in heater its greatest heat, thereby giving to feed water, it is claimed, a temperature of 212° and over from exhaust steam.

The construction is simple. For the removal of sediment and deposit the shell can be removed in a few minutes, heater cleaned, and shell replaced, without breaking any piping, simply by a union being used on inlet and outlet of feed pipe close to shell. This heater can be used for heating or cooling any kind of liquid that will flow through a pipe, being available for hotels, sugar refineries, oil refineries, laundries, etc.



FEED-WATER HEATER.

Foundry Gas Light—Lime in the Foundry.

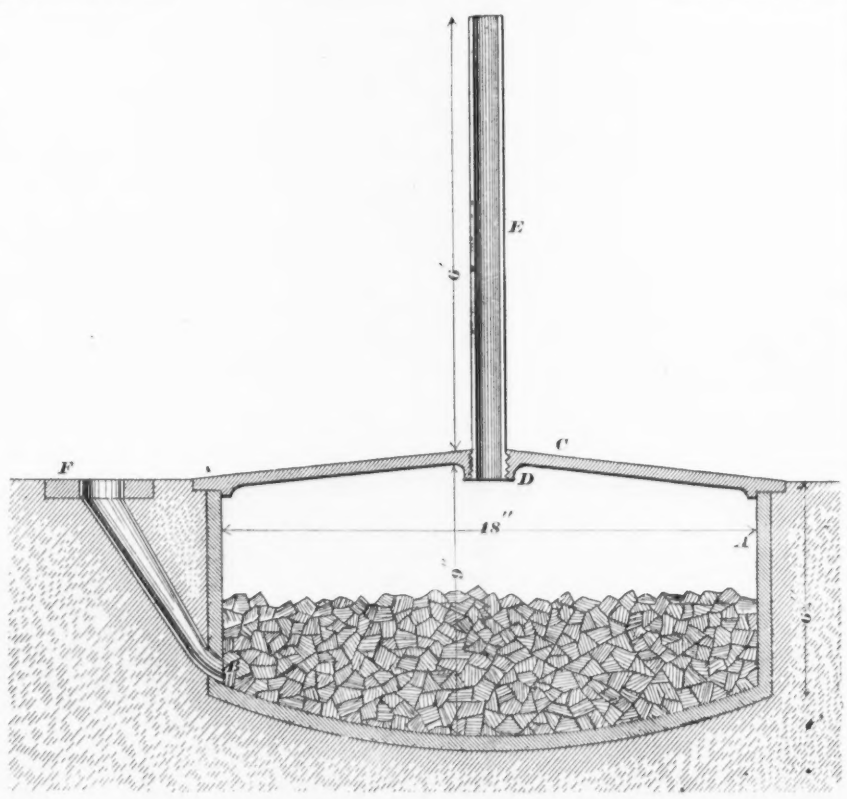
BY ROBERT E. MASTERS.

One of the most dangerous parts of foundry practice is casting in the dark. It always makes me feel uneasy to see men groping their way down long aisles, or working their way between rows of flasks, with the brim of their hats pulled down to keep the glare from the ladle of molten iron, which they are carrying, out of their eyes, so they can see where to step at all. In more than one instance I have known moulders to be laid up for several weeks from burns sustained by stumbling over a sprue or something carelessly left on the floor when casting at night in a poorly lighted shop.

When compared with other departments of manufacturing establishments very little has been done towards lighting up foundries as they should be, either for the safety of the men or the convenience of the work. One will often see an attempt made by the moulders themselves to light up a foundry by sticking torches up in the sand heaps; a stock of these torches, by the way, having been laid in, in some mysterious manner, by the apprentice boys during election times. Kerosene lamps are of but very little service, as their chimneys and reflectors soon get coated with steam and dust from the moulds, so that one can scarcely see where the lamp is.

One of the best-lighted foundries that I have seen in some time was one in which from thirty to fifty men were employed ten hours a day during the winter season, light being furnished by placing sheet-iron plates on piles of flasks in different parts of the shop and building thereon fires of pitch-pine knots. This of course has the objections of smoke and soot.

As this is holiday time, I thought I would introduce a novelty in the shape of a foundry gas light, which I think will be found serviceable where no better means of lighting can be procured by foundrymen who wish to cast every day, and keep the men employed until six o'clock these short days.



FOUNDRY GAS LIGHT.

A is a basin 18″ in diameter, 9″ deep in the center, inside measure, 6¼″ deep, outside measure, at the sides, of ¼″ cast iron. There is a hole 1¼″ diameter at *B*. The cover *C* is 20″ diameter; this makes it large enough to extend over the basin ¾″ all around. A rib is cast on it to fit inside of basin. There is a thread at *D*, into which the pipe *E* is screwed; the basin can be bedded in the floor in the most suitable place in the foundry. A common sprue, or gate, is put in the hole at *B*, and after tucking the sand around it the sprue is drawn out. The cast-iron plate *F* which has a hole 2″ in diameter through it, is placed over this; this will prevent the channel being crushed in if any one should step on it.

A sieveful of bituminous coal is put into the basin, the cover put on, and a 1½″ pipe screwed into it. When it is time to light up the shop during casting time, a little iron is carried in the hand-ladle and poured into the hole *F*, which is immediately covered up, and the gas touched off at the top of the pipe with a "skimmer" in the same manner that a vent of a mould is touched off.

If this basin should be placed in the aisle, the pipe can be taken out in the morning. It will then be no obstruction to either wheelbarrow or trucks, when ready to recharge with coal; the coke in the basin from the evening before can be taken out and used for fuel in the stoves.

I only claim originality for the arrangement of this miniature gas-house. The idea was suggested to me by a moulder who formerly worked in Oldham, England. He stated to me that in a shop in which he was employed there, they did not have power enough to run the other part of the works and furnish blast for the foundry at the same time. After the other departments had finished work at six o'clock the blast was put on in the foundry. To furnish light a hole was dug in the foundry floor, a sieve full of coal and sprue put in as described, and an old web gear wheel placed over the coal, with a pipe in the hub of the wheel. This amount of coal furnished a good clear light for a shop 40 feet square, long enough to take off an ordinary heat.

It is a common practice with some moulders to sprinkle flour around the gate, on top of the flask, so that they can see where to direct the stream. There are several reasons why this should not be practiced—flour is expensive, the smoke of it is anything but pleasant to the eyes, or to the olfactory organs, and it does the sand no good, to say the least. Air-slacked lime will answer the same purpose; it is inexpensive, and is a benefit to the sand. Any foundryman who is making castings in the shape of reservoirs, syrup or potash kettles, etc., and is troubled with their "scabbing" on the bottom, will find they can prevent it by mixing a handful of air-slacked lime to a sieveful of sand and spreading it over the bottom of the pattern when making the mould, especially right under where the iron falls.

Speaking of lime and stoves in this article, calls to mind how much it brightens up the appearance of a foundry by giving the stoves a coat of whitewash now and then through the winter.

Public sentiment is evidently gradually changing in England in favor of measures for protecting industries by some sort of tariff legislation. Eventually this will be forced upon the rulers so strongly that they will be constrained to heed it. This would be a blessing to this country in one respect at least; it would rid it of the arguments of a good many disinterested Englishmen, who are anxious to convince Americans how little they know about the management of their own affairs. It would be a curious circumstance if those who have done so much to teach others should find their own countrymen backsliding to the extent indicated. They seem inclined in England to give it another name; they call it retaliation against countries that favor protection, but we should call it protection pure and simple here.

The London *Times* editorially calls attention to the fact that, while there is no business improvement in England, there are decided improvements in the United States.

Condition and Prospects of the Machinery Business.

LETTERS FROM LEADING MANUFACTURERS TO THE "AMERICAN MACHINIST."

(Continued from last week.)

J. A. Fay & Co. (Wood-working Machinery), Cincinnati, O., write us:

Our shipments and sales for 1885 have been several thousand dollars larger than they were in 1884. We have employed about the same force that we did in 1884, and have run ten hours per day, the greater portion of the time. We have not made any reduction in the price of labor during the year. We have introduced quite a number of new tools in our works, substituting improved machines for old style tools which had become somewhat worn, and were not equal to those containing later improvements. These new machines have reduced the cost, and they have also increased the amount of our productions.

Our orders for complete outfits of our machines are not as large as they have been at this season in years past, but we are receiving a large number of orders for one or more machines from the best and most responsible of our customers. Apparently they feel that it is a good time to introduce improved tools in place of old ones, and in some cases we know they have ordered because business has improved with them. During the year we have brought out quite a number of improved machines, which in some cases will produce double as much work as the old machines of the same class have done in the past. By the help of these new tools we believe our trade for next year will be still larger than it has been during the present year just closing.

Syracuse Twist Drill Co. (Measuring Machines, etc.), Syracuse, N. Y., write us:

Our sales for 1885 have been nearly double those of 1884. We have increased our facilities so as to about double our capacity. We have also introduced a number of new devices, and between the new and old look for a continued increase of business the coming year. Prices have been ruling low, but we are endeavoring to meet them by improved methods and machinery without any considerable reduction in wages.

Sebastian, May & Co., Cincinnati, Ohio, write us:

Since writing to you in December of last year we have nearly doubled our plant, and in order to supply the constantly increasing demand for our lathes we are still adding new and improved machinery and tools.

We have during the past year run a full force, full time, and still have hardly been able to keep up with our orders, which have come to us from all parts of the world. This morning's mail brings us an order for a complete outfit to go to Peru, South America.

As our machines become better known we are enabled to get better prices for them; people prefer to pay a little more for a good tool than for a poor one. We enter the new year with every confidence that it will be a prosperous one. What we have accomplished has been by persistent and constant effort, which must be continued to obtain the best results.

Niles Tool Works, Hamilton, Ohio, write us:

We have been fairly active during the past year, having run full time during the entire year, and about two-thirds of the largest number of men we ever worked.

During the past three months business has improved very considerably, and we are now rapidly increasing our force and running overtime. The prospects appear to us to be very good, and we feel encouraged to make preparations for an increased business during the coming year, and have made quite a number of improvements of one kind and another, in order to shape ourselves for the business which we felt sure was coming. We are now enlarging our foundry, putting in additional side tracks, adding tools, and making every preparation to handle our business promptly and economically.

Prices of materials have increased and wages are on the mend, consequently the price of our product must also improve. Prices have been too low, and we are confident that the increase will be material in a very few months.

We have brought out a number of new tools and improved others during the past year. Among the most notable in new machines we have turned out are the following:

Car-wheel lathe for turning steel-tired car wheels. This machine embodies new principles in wheel turning, and has been fully illustrated and described in our pamphlet on "The Turning of Steel-tired Car Wheels," extracts from which you have published. Another, a mammoth slotting machine, 48" stroke, weighing 55 tons. Another, a multiple drill for drilling steel-tired wheels. This machine has 21 spindles, and is capable of drilling 40 wheels per day. Also other new machines, such as 16' boiler rolls, bridge-chord boring machine, etc.

W. P. Davis, North Bloomfield, N. Y., writes us:

Our business during 1885 has been fair, and is steadily growing, notwithstanding the general depression of trade.

We are becoming more widely known, our trade not being confined to the United States; having our machines in use in England, Scotland, France, Australia, New Zealand, South America, Mexico and Canada. We have recently received several orders from Nova Scotia; also from one of the largest machinery dealers in Stockholm, Sweden.

Four years ago we were unknown outside of a radius of a few miles, having a general jobbing business, and building some special machinery and steam-engines. At that time we commenced advertising, with results as stated. We then had no outside trade, while now our machines are sold by nearly all the large dealers in the United States.

We have made no reduction of prices, but have improved our machines in strength and workmanship, and where quantity and quality of work are required they will stand the test. We consign no goods, but sell at a low price, and find this is the most satisfactory arrangement for all concerned.

We made no changes in our plant this year, as the extensive additions made in 1884 provide facilities for a large increase of business. Material is cheaper than in 1884, while wages remain about the same. We have completed designs for, and shall soon put on the market, a new surface grinding machine, at a moderate price, with capacity for grinding 24" long, 6" high and 6" wide.

We ran full time during the past six months, and Dec. 1st. had no drills on hand, but now have 37 drills and key-seaters under way, that will be completed Jan. 30th, and, judging from recent orders and correspondence, we anticipate a good trade early in 1886. While we do not expect a "boom," we think business of all kinds will improve during the year.

Pond Engineering Co. (Engineers and Contractors), St. Louis, Mo., write us:

There have been, during the past year, very few new manufacturing enterprises established, and hence our business in this department has been somewhat behind that of last year, although we feel satisfied we have done our share of that work, and the prospects for the next year, are more encouraging than they were this time last year (1884).

The popularizing of electric light, has created a great demand for power plants for electric-light stations, and we have been very busy in this department throughout the past year. It has been our policy to be entirely neutral as to the system of electric lighting used, and, by so doing, we have been favored with work from nearly all the electric-light firms operating in the West.

Never before in the history of this country have there been so many water-works constructed as during the past year (1885). All material which enters into their construction has been very low. We confine ourselves strictly to furnishing the machinery in the pump house. Our business in this department shows a large increase over that of 1884.

We have also been kept busy in our engineering department, and have prepared plans and specifications for a large amount of work. We feel much pleased with the amount of business done during the past year, having more work under contract at the present time than ever before.

We consider the prospects for an increase in business next year (1886) very good.

T. R. Almond, 83 and 85 Washington street, Brooklyn, N. Y., writes us:

From conversations with several of my customers, I have good reason to believe that there has been during the past three months a very decided improvement in business, and that this improvement is likely to continue. The increased demand for my chucks indicates to me, very forcibly, an improvement, and, as I am now receiving quite a number of orders for my angular coupling, I begin to think that there really is something in the reports.

The Beckett & McDowell Manufacturing Company, 120 Liberty street, New York, write us:

We are busier now than we have ever been before at this season of the year, and work enough to keep us busy for several months.

The inquiries from parties proposing to put in machinery of special kinds made by us are larger by 100 per cent. than we have ever before seen. We think this is largely due to increased prices of material and labor, and the natural accumulation of worn-out machinery, that requires renewal, or enlargement of plants.

From the outlook to us, the year of 1886, among the manufacturers of our class, is destined to be the best for many years.

Oneida Steam-Engine and Foundry Company, Oneida, N. Y., write us:

Our business during the year just closed has turned out better than we expected.

Our foreign trade since September 1st has been especially good, and we have now several large orders booked for export in January.

The new sizes of drill chucks, viz., No. 2½, extra strong, holding 0 to 1"; No. 3, holding 0 to 1½", and No. 4, holding 0 to 2", which we put on the market at the beginning of the year, have taken well; and, as we have not had a word of complaint from them, we believe them to be quite satisfactory. That the improved Little Giant is steadily growing in favor is shown by an increase of sales in that branch of our business. We now leave the surface which bears on the drills as hard as is possible to make it, which adds much to their durability.

Prospects look well for the future with us.

Gardner Governor Company, Quincy, Ill., write us:

Our business for 1885, on the whole, has been satisfactory; profits small, but the volume of trade fully up to expectations.

We have made no important addition to our machinery and tools, for the simple reason, we were amply supplied during flush times, and since then there has been no necessity for increasing our capacity. The very conservative spirit of the engine-builders, that prompted them during the past year to order only for their absolute wants, has been productive of good, and we believe there is an increased feeling of confidence that will make them more generous with their orders the coming year. Contracts already closed indicate this, and we confidently expect a larger volume of trade. We have made no reduction in our wage account, and we note with pleasure that nearly all material used in the manufacture of our governors is slowly but steadily advancing in price.

The "signs of the times" are encouraging.

Chandler & Farquhar (Machinists' Supplies and Hardware), 177 and 179 Washington street, Boston, write us:

We have had a very fair trade in the past year, and some improvement on the previous two years. We made a change in location in the summer, which has resulted to our advantage, and the outlook for 1886 is good, with a prospect of better prices.

Though we are a comparatively new house (but three years in business), we have received much encouragement, and are building up an excellent trade.

The Hartford Tool Co. (Machinists' Small Tools), Hartford, Conn., write us:

During 1885 we have added to our line of tools three new articles, besides many new sizes that have been demanded by the trade. We think prospects for 1886 are good. Having sold larger orders, and more of them, during the past three months than for any three months during the past two years, we feel very much encouraged. We think manufacturers are looking for improvements to cheapen and make their work better.

Thos. H. Dallett & Co., 3015 Chestnut street, Philadelphia, write us:

The past year (1885) has been rather an eventful one with us. In June last our place of business was destroyed by fire, making it necessary to get into new quarters with as little delay as possible.

We now have our business in good shape again; have added several new tools to our plant; have a stock of nearly all sizes of portable drills and hand drills, and, in addition to our regular line of tools, are prepared to build all kinds of special machinery for the light manufacturing trade.

Business has improved with us during the latter part of 1885, and, having orders which will carry us well into 1886, have made arrangements to move into a larger building with increased facilities for the improvement in business we anticipate in the future.

Westinghouse, Church, Kerr & Co. (Contracting and Consulting Engineers), 17 Cortlandt street, New York, write us:

We have to report a reasonably gratifying business through the earlier part of the past year, followed by a marked increase within the last few months. The month just closed gives us by far the largest business in our experience, and the amount of specific inquiry on hand leads us to believe that the future is full of assurance. The outlook is good in all departments of our business, especially in our new department of incandescent lighting on the Westinghouse system, although the sales of engines to general manufacturers are so numerous as to indicate a healthy condition of affairs throughout our territory. Our shops have recently increased their force of men, and have purchased a number of new tools. Prices for labor have not materially changed. We have effected quite material improvements in the manufacture of our engines, among which may be mentioned connecting-rods of forged steel for all sizes, the smaller sizes being drop-forged. The coming year will, we expect, enable us to place on the market the Westinghouse compound engine, for which we expect a very general recognition. A very gratifying feature of our trade during the past year is in the fact that our total account for bad debts amounted to less than $\frac{5}{10}$ of 1 per cent. of our business.

Brehmer Brothers (Special Machinery), Twelfth and Noble streets, Philadelphia, write us:

During the past year we have made progress in one branch of our business—namely, in that relating to the cutting of beveled gear-wheels. As the superiority of our work in this line becomes more generally known, we obtain accordingly more orders. In every other respect we have felt the general depression of trade.

The Pratt & Whitney Company (Machine Tools), Hartford, Conn., write us:

We now employ 440 men nine hours per day on the average. Have done business during 1885 to the amount of $450,000, or about 7 per cent more than in 1884, and have reasonable expectations of further increase of business in 1886. Prices of material and labor have changed but little during the year, but our list of manufactures continues to grow.

I. P. Richards, Providence, R. I., writes us:

I have built a new shop and filled it with new tools the past year, especially for the manufacture of my standard punches and dies. Business is looking better for 1886, and I am now ready to supply all those who are punching iron or steel, especially boiler-makers, with the best tools ever used.

The Hartford Boiler Insurance and Inspection Co., Hartford, Conn., write us:

The business of this company for the year 1885 was the largest in its history. We cannot give exact figures as our statements are not yet made up. The prospects for the incoming year are very favorable.

Crosby Steam Gage and Valve Co., 95 and 97 Oliver street, Boston, write us:

We have no particular change to note in our business for this year. We are glad to report an increase over the sales of the previous year, and to state that we have made no changes in price of wages; and that all the departments of our shop are run on full time.

The National Pipe-bending Co., New Haven, Conn., write us:

Our business for 1885 has shown an increase over that of 1884. The first four months of the year gave indications of a very prosperous trade; but the summer months' business was very quiet, and orders were very slow. The trade, for the last four months, has come up very well, and has made a fair amount for the year. We anticipate a good fair trade for the spring of 1886, but do not expect any lively boom. The call for our feed-water heaters has increased in the South and West, and we look for further business from the South. The prices of labor, product and materials remain about the same with us.

Kensington Engine Works, Philadelphia, write us:

During 1885, although the prices have been very low, we have done a larger business than in 1884. We have over ninety Buckeye automatics in use in and about Philadelphia, with the demand steadily increasing. We are just completing an extension to our works, 75x159 feet, and shall make a number of improvements during 1886. While we have not reduced wages, we have been necessitated, in order to compete and meet the market, to introduce new tools and perfect our shop system, so as to give our customers better work at lower prices than we have been able to do in the past.

D. Frisbie & Co., 481 N. Fifth street, Philadelphia (Friction Clutches and Elevators), write us:

While we have not had the amount of work in the past year we would like, we have to report the past six months a gain of about thirty-three per cent. over the first six months. As we have, for the past year, been making several new patterns for belt-elevators, and have completed a new steam-elevator engine, the prospects for our business, for the coming year, are good. With good work and close prices, we hope to get our share of what is offered.

Knowles Steam Pump Works, Boston and New York, write us:

Trade has been very good with us throughout the year, with a gradual increase during the last four months. We have now as many orders on hand as we can conveniently handle, and consider the prospects good for 1886.

Harrison Safety Boiler Works, Germantown Junction, Philadelphia, write us:

We are agreeably surprised at the result of our business for the past year; for as the general improvement in trade did not make its appearance with us until about May, we were handicapped by several months' dullness, which reduced the volume of business more than we had expected. We were extremely busy all summer long, with a class of work which was highly satisfactory. As we employ only first-class labor, and use nothing but materials of the highest quality, our product costs us about the same as a year ago.

We have made some further improvements in our boilers—keeping pace with the times—and feel that the coming year has in store for us an increased output and better prices. Inquiries are much more frequent, and prospective buyers more ready to close. We have a number of orders on hand at present. Our business is now thoroughly established under present management, and our works well equipped, and as we are, in various ways, proving to the public at large that our boiler has proven, by twenty years' constant use in many places, the intrinsic merits peculiar to its unique construction, we look forward to a better year for 1886.

Secretary Lamar has decided that until a patent is delivered into the possession of the patentees it is not beyond recall by the Commissioner of Patents. The question came up when a patent had been signed by the Commissioner and Secretary, and was recalled before it was delivered, but the patentee claimed that within the meaning of the law the patent was issued and could not be recalled.

American *vs.* English Locomotives.

Our English friends are, as is well known by this time, in an unpleasant frame of mind regarding the exportation of American locomotives to British colonies, but there is no reason why so sensible a journal as the *Mechanical World* should lose its head over the matter, as witness the following:

We are frequently asked by readers of the American papers if there is truth in their frequently reiterated statements that American locomotives are greatly superior to those of English make. To this we can give, on personal experience, an emphatic denial. Taken as a whole the American engine is a decidedly inferior machine. American engines have some excellent points. They are free running; so also are our own outside-cylinder engines. The valve gear of all American engines we have seen, gives a better steam distribution, as shown by the beat, than the same number of English engines picked at random. Their mechanism is more get-at-able. Having said this there is little more, if anything, to be said in their favor. The connection of parts, such as spring hangers, is very weak, and the use of set screws in place of through bolts is another fault. No doubt such weak connections may serve their purpose in America, where speed, as we know it, is almost unknown, but they would never stand the hard usage of an English high-speed service. Hence it *may* be possible to supply cheaper engines from America to our colonies, where speed is as yet unknown, than English makers can send, adhering to substantial work. Our own experience of the matter is, however, that English engines of first-class express make were delivered in Australia at a far less price than the same class as to weight, cylinder diameter, and number and arrangement of wheels were delivered from America. The English engines were well made in every respect. The American engines were decidedly inferior, and all made for exterior show; the coupling rods, for example, being black on the inside and polished on the outside only. The almost invariable assumption of American writers that there are no outside-cylinder engines in England is too untruthful to require further notice than to say it is just a type of the veracity of their statements. We believe inside-cylinder engines are not to be found in the United States. The reason of this is not that the outside-cylinder is thought to be the best, but simply because the locomotive builders of the States cannot produce a cranked axle any more than they can forge a wheel.

Our contemporary's assumption that the valve gear of American engines gives better steam distribution is, doubtless, correct; also that "their mechanism is more get-at-able."

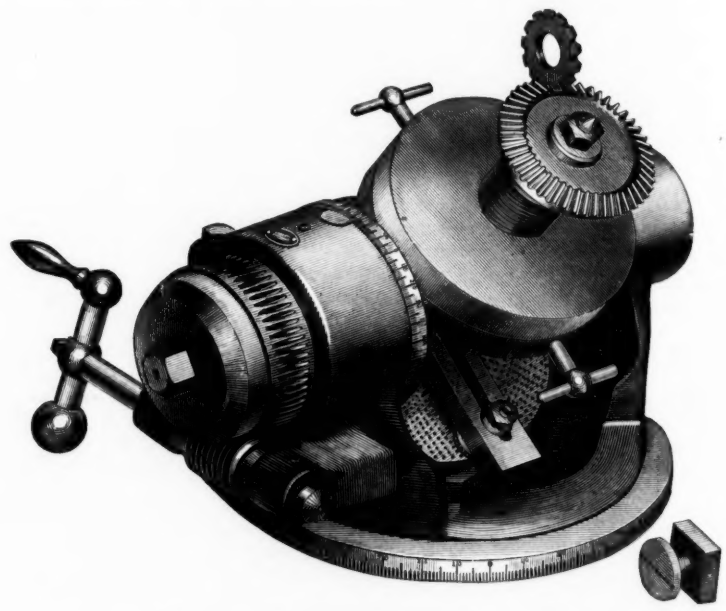
The statement that speed such as is common in England is unknown in this country is one of the pleasing fictions that Englishmen cling to in spite of facts. Argument is useless. As a matter of fact, however, on many American roads as good speed is maintained as on English roads.

As to structural weakness, the fact that on our somewhat rougher roads these engines with such "weak connections" stand the service at materially less cost for repairs than English locomotives on English roads sufficiently disposes of that argument. American locomotive-builders make these parts as strong as experience demonstrates to be necessary; that they do not place metal where it is not required, and that they do not object to "exterior show," where it comes naturally, is to their credit.

That it is "the almost invariable assumption of American writers that there are no outside-cylinder engines in England," is simply one of the mistakes of our contemporary, only equaled by the statement: "We believe inside-cylinder engines are not to be found in the United States." We volunteer the information that there are yet inside-cylinder engines in use in this country; that formerly there were a good many such, and that they have very generally gone out of use, not "because the locomotive-builders of the States cannot produce a cranked axle," but for other and better reasons. We venture the assertion that American cranked axles give just as little trouble as those of English make.

If our contemporary will study the reference in its article, as quoted above, to the "get-at-able" condition of the mechanism, it will have one point in favor of outside-cylinder locomotives; there are other points that will require some study before the full reason why British colonists prefer American to English locomotives is fully comprehended.

Universal Head for Milling Machines, Planers and Shapers.



UNIVERSAL HEAD FOR MILLING MACHINES, PLANERS AND SHAPERS.

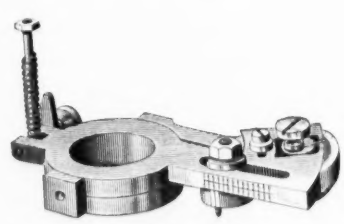
This head is designed with a view of providing for compactness and range. The journals and bearings are so arranged that when the head is locked for cutting operations it is as rigid as if in one piece. This, in connection with the fact that the face-plate is close to the journal, enables heavy cuts to be taken without noticeable vibration. The locking devices are so arranged that, while of easy access, they are short and strong, thus securing rigidity.

In range: the spindle makes a complete revolution on its horizontal axis, and the entire head a full turn on its base, each of which is marked by a graduated scale of 360 degrees.

In addition to general work, this head is believed to be especially adapted for cutting bevel, spur and worm gearing, tools for valve-seats, taper reamers, friezing bits, marking and dividing dial-plates, cutting right and left-hand work with the same tool, etc.

An adjustable index-pin is provided, as shown in the small engraving. This pin is adjustable by degrees, and is a convenient device for cutting bevel gears, in which it is necessary to cut through the same groove twice. The use of this piece permits ready setting for the second cut without loosening or deranging any of the parts.

The Cincinnati Screw and Tap Co., Cincinnati, O., are the manufacturers.



INDEX PIN.

Bench Lathes.

What modern practice has done for machine tools is very well shown in the single instance of bench lathes. These tools have been on the market for years, but it is only until recently that they have found much favor with machinists. The chief reason for this is because they formerly lacked the quality of *handiness*, now they find favor because this quality has been added. Modern practice has taken up this part of the matter until bench lathes are made so convenient that they are fast coming to be considered indispensable in many shops where no use for them was formerly found. Their utility has been chiefly increased by the adaptation of quick means of stopping and starting, and the employment of various small tools and appliances that have come into use mainly during the past ten years. The metal in revolution is light in comparison with floor lathes used for small work, and with approved means of stopping and starting, these operations consume but little time at high revolution, hence the speed is likely to be kept nearer what it should be for small work than what it would be with a heavier and more unwieldy lathe. A correspondent writing on this subject, says:

"In going through a machine shop, I noticed that all of the bench lathes were in use, and that the larger lathes were idle. Ease of manipulation, I believe, is the cause of this, and the manufacturer gets the benefit of this in a saving of time. I asked an intelligent and capable workman what he thought of the bench lathe. Said he: 'I would buy one myself before I would get along without one.' Ease of manipulation again."

We receive a great many letters, to which we have usually replied by mail, containing such queries as the following, which we give as a fair example: "Where could I go to learn the machinist's trade and have a chance to study geometry and mechanical drawing? Would the ——— Company, or the ——— Company take apprentices?" We take this occasion to say in a general way, in answer to such queries, in most machine shops where apprentices are taken; there are generally more applicants than there is room for. The only way we know of, for one at some distance, to find if he can get a position as apprentice with any firm he may have in view, is to write them. If an apprentice is strongly desirous of studying geometry and mechanical drawing, he can and will do it at home, by the kitchen fire, if necessary. There are not many shops that provide for educating apprentices in these branches. Generally, in large cities, there is no difficulty in finding instructors or evening schools.

A Paper-maker's Collar.

A "paper-maker's collar" is often useful in case of a break-down. It consists of two or three pieces of wood cut to fit between a loose collar or gear and a coupling, or some fast pulley. Wind a stout string around the sticks to hold them in place, and the shaft can be run until new set-screws or keys are fitted.

Origin of the Name "Consolidation" Locomotive.

A correspondent says: "I would like to know exactly what is consolidated in the 'consolidation' locomotive. The names eight-wheeler, ten-wheeler, Mogul, Forney, and so on, are intelligible, but I cannot perceive anything applicable about the word 'consolidation' to the engine that bears that name." As we have heard this question discussed several times, it may be desirable to explain the origin of the name, which was not suggested by anything about the construction of the locomotive. The first consolidation engine was designed by Mr. Alexander Mitchell, then master mechanic of the Lehigh & Mahanoy Railroad. Just about the time the engine was completed, the Lehigh & Mahanoy Railroad was consolidated with the Lehigh Valley Railroad, and the name consolidation was given the engine to honor the event.—*National Car Builder.*

By way of timely warning to the clerk of the weather, the New York *Morning Journal* remaks that "Machine-made ice may be used exclusively next summer, should Jack Frost continue to neglect the duty he owes to winter." We hope it will not turn out that Mr. Frost's untoward behavior is due to collusion with the ice companies, who will next summer need a decent excuse for putting up the price of their commodity.

William H. Hoffman, formerly well known to our readers, has been for about two years past connected with a Southern iron company, in charge of the mechanical department of their business, including blowing engines, locomotives, 20 miles of railroad, and machinery and machine shop connected therewith. Mr. Hoffman's later headquarters have been at Cincinnati, Ohio. He thinks of locating again in New York.

There are 25 Japanese in Philadelphia, says the *Record*, the sons of titled gentlemen in that country, who are learning the profession of civil engineering. Many of them are on the engineer corps of the Pennsylvania Railroad Company, and others are in the Polytechnic College. They are sent there at the expense of the Japanese government to study the building of railroads to their minutest detail.

When American establishments can furnish locomotives in Australia for $2,000 each less than the price at which work not so satisfactory can be obtained in England, and in a much shorter time, as was recently done, our manufacturers certainly ought to be encouraged to compete actively for business in that great continent.—*Railway News.*

Iron says: Just why the fuel users of Cleveland or of any other section where good bituminous or anthracite can be cheaply had, should worry over the natural gas problem, we cannot see. They can make as good, if not better, fuel gas at an expense but little exceeding that of piping and governing the natural gas.

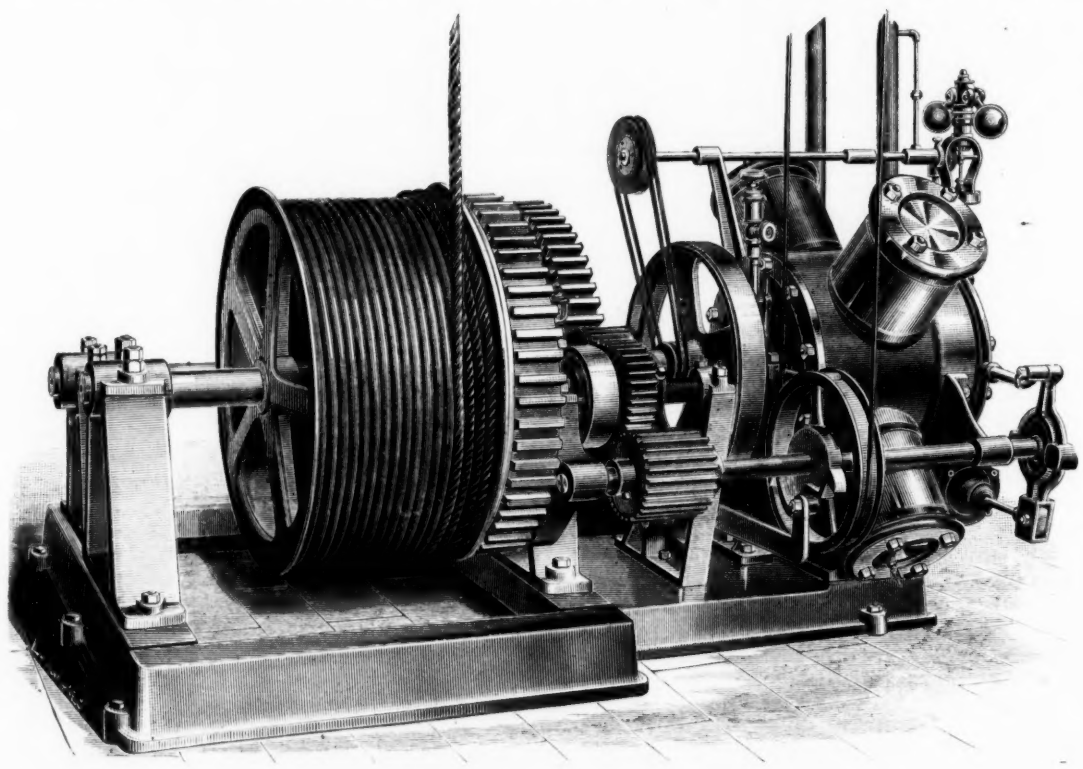
The Cowdrey Elevator Engine.

The engraving represents the adaptation of the Cowdrey four-cylinder engine, to the purpose of operating elevators. It is claimed for this arrangement that the power is applied to hoisting in such continuous and equable manner that no jar or shock is possible with any load, up to full hoisting capacity, and that the load is securely held in any desired position, by operating the engine, and without the aid of friction wheels or straps.

A stop motion is provided at extreme of up and down motion, also an arrangement for instantly stopping the engine, should the car meet with an obstruction in its downward progress. The engine, it is claimed, is unlimited in speed, and the power so applied that no fly-wheel is required, and no foundation for engine necessary. The engine may be set on any floor strong enough to withstand the direct strains of hoisting. Lubrication of all parts, except the cylinders, is done automatically.

For the engine it is claimed that the absence of strap-joints, stuffing-boxes, or similar parts requiring adjustment, makes looking after them a simple matter; also that the main parts being in one piece, the engine is not subject to getting out of alignment. All working parts are enclosed, thus avoiding dust and dirt. Of course, there are no dead points in the revolution. Steam is worked expansively, instead of full stroke, in hoisting.

D. Frisbie & Co., Philadelphia, Pa., are the manufacturers.



ELEVATOR ENGINE.

An interesting departure has lately been made, according to the Lowell *Weekly Journal*, by Franklin Nourse, agent for the York Mills, Saco, Me. A school for all employes under fifteen years of age has been opened. The children are to attend school for four hours daily, and still receive full pay.

Tests of Iron Melted in an Ibrugger Furnace.

A recent issue of *Iron* gives some interesting tests that have been made, the results of which were brought before the recent meeting of German iron-founders at Eisenach. Four series of tests were made, No. 1 consisting of melting two tons of foundry iron without any additions; No. 2, melting one ton of foundry iron with an addition of five per cent. of wrought iron; No. 3, melting one ton of foundry iron with 20 per cent. of cast scrap; No. 4, melting one ton with 50 per cent. of cast scrap. In series Nos. 1 and 2 the same iron was melted over again six times. The cupola was charged first with 200 kg. (441 lbs.) of coke, and then followed the charges of 300 kg. of stock, half open-grained and one-half medium-grained, of 20 kg. (44 lbs.) of lime to 25 kg. (55 lbs.) of coke. The pressure of the blast was equivalent to a 62-cm. (24-in.) water column. The iron was cast into rods for the bending test 1304 mm. (51 in.) long and 30 mm. (1.18 in.) square, rods of the same size tooled down to 25 mm. (0.98) square for tensile tests, plates for drop tests, roofing slabs, wedges, gear-wheels, pulleys, etc. Herr Jungst has put his results into the form of graphic sheets, from which the following tables have been made:

Breaking Load—30 mm. Rods Resting on Bearings 1 m. Apart.

	Number of Melting					
Series	1	2	3	4	5	6
No. 1	23.3	25.8	31.2	37.3	29.2	21.6
No. 2	24.2	26.6	27.3	24.1	32.0	26.9
No. 3	28.1	—	—	—	—	—
No. 4	26.6	—	—	—	—	—

All the figures in this table are kilogrammes per square millimeter, the unit being equivalent to 1,422 lbs. per square inch. The shrinkage in casting was as follows, the figures being millimeters in a length of 1,304 mm.:

Shrinkage.

	Number of Melting, mm					
Series.	1	2	3	4	5	6
No. 1	11.0	8.0	7.2	11.0	15.0	17.0
No. 2	—	12.0	12.0	10.5	12.0	13.9
No. 3	14.0	—	—	—	—	—
No. 4	12.5	—	—	—	—	—

The waste in melting was determined in the first series only. It was 5 per cent. in the first melting, 3.9 per cent. in the second, 3.0 per cent. in the third, and 3.3 per cent. in the fourth melting. A number of drop-tests were made also. These melting tests confirmed the general results of Wachler's investigations, which showed that remelting in a cupola once or twice produces a more suitable pig for foundry purposes; makes it purer, denser, and lower in graphite, especially when open-grained iron rich in carbon and silicon was used. They prove that continuance of the remelting usually acts unfavorably upon the quality of the foundry iron, and makes it hard and brittle. In melting in the Ibrugger furnace, the surprising result was attained that the maximum strength of the iron was reached at the fourth melting in the first series and at the fifth melting in the second series. In the first series a bar of cast iron resting on supports 1 m. (3.28 feet) distant bore a weight of 37.09 kg. per square millimeter (53,757 lbs. per square inch). Slabs broke only after 22 blows of a 25 kg. (55 lbs.) drop falling from a height of 3.75 m. (18.86 feet). A gear-wheel withstood 64 blows of a 22-lb, hammer; a pinion-wheel resisted 125 blows of the same hammer, 130 blows of a 13.5 kg. (29.7 lb.) hammer, and broke only at the second blow of a 650 kg. (1433 lbs.) drop falling from a height of 6 m. (26.2 ft.). The following analyses of iron used in the first series illustrate how well the carbon remains in the iron, and how slowly the graphitic carbon is converted into combined carbon:

	First Melting.	Fourth Melting.	Sixth Melting.
Graphite	2.73	2.54	2.08
Combined carbon	0.66	0.80	1.28
Silicon	2.42	1.38	1.16
Manganese	1.09	0.44	0.36
Sulphur	0.04	0.10	0.20
Phosphorus	0.31	0.30	0.28

The maximum strength was possessed by the iron of the fourth melting. The second series proved disappointing, and results not coming up to expectations, although the addition of 5 per cent. of wrought iron led to looking forward to the contrary. The heavier castings, although they were soft, were full of blow-holes, and the rods showed comparatively little strength. The reason for the surprising result became apparent in the fourth melt. In order to reduce the cost of the trials, only one ton was melted in the second series as compared with two tons in the first. The result was that in that small quantity the iron was not well heated, and was cast too cold. On the fourth melt the orifice between the upper and the lower part of the cupola clogged, and the temperature fell in consequence. The iron was cast cold, and the effect appeared in the record of the fourth melt. The cupola was then strongly heated for the fifth melt, iron for other purposes was put through, and then the trial cast was made, which showed a marked increase in the strength and softness of the iron. This proves that hot melting is necessary to obtain solid, dense and soft castings.

Our thanks are due the Brotherhood of Stationary Engineers, of St. Louis, Mo., for an invitation to attend their annual dress ball on Friday evening, January 15; also to Mr. E. S. Henry, through whom the compliment is tendered. Unless we get orders to "shut down" early that day, we fear we shall not be able to be present except in the spirit, but the courtesy stands to the credit of the brotherhood all the same. The programme of dances, which accompanies the invitation, is equal to anything seen. We quote, at random, a few of the exercises, which will give a fair idea of its character: Schottische, "Let her go;" Quadrille (chat), "Hydraulic test;" Racquet, "Blowing off;" Quadrille, "On the center;" Waltz, "Fire up;" Supper march, "Fill her up;" 35 and last, Virginia Reel, "Owl car, or walk home." This is believed to be the oldest body of organized engineers in the country, having been instituted in 1878 and chartered under the State laws of Missouri in 1882. The objects of the order, judging from a perusal of a copy of their constitution and by-laws, are excellent. We hope, to quote further from the programme, that there will not be a single "collapsed flue" at the conclusion of the ball.

The following may be pertinent in this country as well as in England: "The Board of Trade have, we understand, addressed the following circular letter to the leading railway companies: 'Sir—I am directed by the Board of Trade to inform you that their attention has been called to the subject of railway bridges constructed of iron. It appears to them that lapse of time and possible deterioration, changes in the weight and number of trains, increased experience concerning the stresses which the metal will bear with safety, are circumstances which point to the necessity for careful and renewed attention. Under these circumstances the Board of Trade would be glad to learn what steps the —— railway company are taking on this subject, and whether they have any information or suggestions which they can place at the disposal of this department.'"—*The Ironmonger.*

Tool Rooms.

We notice what purports to be an extract from a paper read by George Richards before the Manchester (England) Association of Employers and Foremen, of which it is said, with reference to some of the hints: "They are apposite to this country." We agree with this, and as reason for our faith append the following, the italics being used for the sake of clearness:

From Mr. Richards' Address.

Many shops that before the advent of the tool-maker could count up time equal to that of two or three men constantly *employed* in making *or repairing* tools *found that* upon employing a skilled tool-maker, and giving him the necessary machinery to work with, he not only *made* all the tools, but *devised* special ones for lessening time *in* many classes of work.

From an Editorial in the AMERICAN MACHINIST *of Sept.* 12, 1885.

Many shops that before the advent of the tool-maker could count up time equal to that of two or three men constantly *engaged* in making tools, *find* upon employing a skilled tool-maker, and giving him the necessary machinery to work with, that he not only *makes* all the tools, but *devises* special ones for lessening time *on* many classes of work.

[We could continue the comparison if necessary, but the above seems to be sufficient.]

Science says: "An Italian ship has been sheathed with glass plates, cast like iron plates, so as to fit the hull, to take the place of copper sheathings. The joints of the plates are made water-tight by the use of water-proof mastic. The advantages claimed for glass over copper are its insensibility to oxidation and its exemption from incrustation.

There is a superstition that the gift of a knife cuts friendship; but at the Champion Works of Whiteley, Fassler & Kelly, Springfield, Ohio, they do not seem to look at it in that way. On Christmas day William N. Whitely, of this firm, presented each of the 900 employes at the East street shops with a Christmas souvenir, in the shape of a splendid pocket knife.

We receive so many letters commending the AMERICAN MACHINIST, and publish so few (as our readers know), while none the less fully appreciating them, that we feel sure our readers will note the subjoined communication with pleasure, coming from such a source.

John Lang & Sons, Johnstone, Scotland, "special tool makers, lathe makers by appointment to the Admiralty," etc., write us:

We have pleasure in enclosing subscription for next year's delivery of your valuable periodical. We find no other paper to approach yours for originality of ideas in connection with the machinist business. We think every machinist should have a copy weekly; it would pay him over and over again by the information he would gain in perusing the "Letters from Practical Men," and similar articles, where the experience of men of ability is given, extending in many cases over years of practical observation. With such opportunities of learning, our young machinists (and many old ones too) might double their store of knowledge and become more valuable to their employers, have more interest and pleasure in their work and command better salaries. We have plenty of work in hand at present with good prospects for the coming year. We are busy finishing a dozen new lathes to erect in our works, to save us from running a night-shift as we have had to do pretty much during the past year.

Prior to 1861 the duration of a United States patent was fourteen years. Under the Act of March 2, 1861, it was enacted that all patents thereafter granted for processes, machines, manufacture or composition of matter, should remain in force seventeen years.

Soda Engines.

According to the Chicago *News*, a Mr. Zimmermann is in Chicago for the purpose of introducing the German soda locomotive engine, about which foreign technical journals have said considerable. One of the locomotives is to be tried on a street-car line in Chicago. The *News* says:

"The process of propulsion by the soda locomotive engine is, as explained by Mr. Zimmermann, by placing a quantity of diluted soda lye, raised to a boiling point, in a closed tank in intimate contact with the steam boiler of the engine, filled with steam and water in the usual proportions and at the usual working pressure. Even where the water is put in cold, steam is raised by the heat of the diluted soda lye. Upon opening the throttle, steam passes into the cylinders, does its work, and then passes into the soda solution through the exhaust pipe, which ends in a perforated tube extending through the soda, the remaining heat being absorbed into the latter. The increase of temperature in the soda represents the work done in the cylinder, the action making the machine an automatic heater, responding by greater heating to the larger amount of work called for. By reason of this, after a long run with crowded cars, the temperature, both of the soda and of the steam, may be higher at the end than at the start. When, however, the power stored in the soda and steam together, by its steady diminution, no longer maintains the necessary difference of the temperature, the soda lye is discharged, and a new charge of hot condensed soda is taken in, which takes place at the company's stations.

"Mr. Edward Koch, of this city, who visited Germany last summer and saw the operation of the Honigman cars, said to a reporter yesterday that in Germany the engine was usually placed in a separate car, and drew as many street cars—one or two or more—as were required for public accommodation. They could be made, however, so as to accommodate passengers in the car itself where the machine was, as in the case of the cable cars. It was built like a railroad engine, only that it was charged with heat before it went out, and therefore emitted no steam or fire or smoke. It did not make any heat. The machine took up but little room, and, as it furnished the motive power, no difficulty could arise such as resulted sometimes from the breaking of a cable or machinery on a cable road. Street railroads could be operated with such engines at fifty per cent. less in operating expenses than with horse-power. The use of the engines would save both time and money."

Sunday Railroad Work.

In March, 1884, according to the *Springfield Republican*, Samuel Read, of Worcester, Mass., brought suit against the Boston and Albany Railroad Company (where he was employed as engineer) for damages because of injuries received from an accident which happened to him there, which left him with a broken leg. He had been summoned by the officials to work early one stormy Sunday morning. While walking to the round-house he was struck by a train. A verdict was given for the defendant and was overruled by Judge Allen, who summed the whole statement up in a nutshell in his decision, saying that "the work in which the plaintiff was engaged on the Lord's day contributed to his injury and was not a work of necessity or charity."

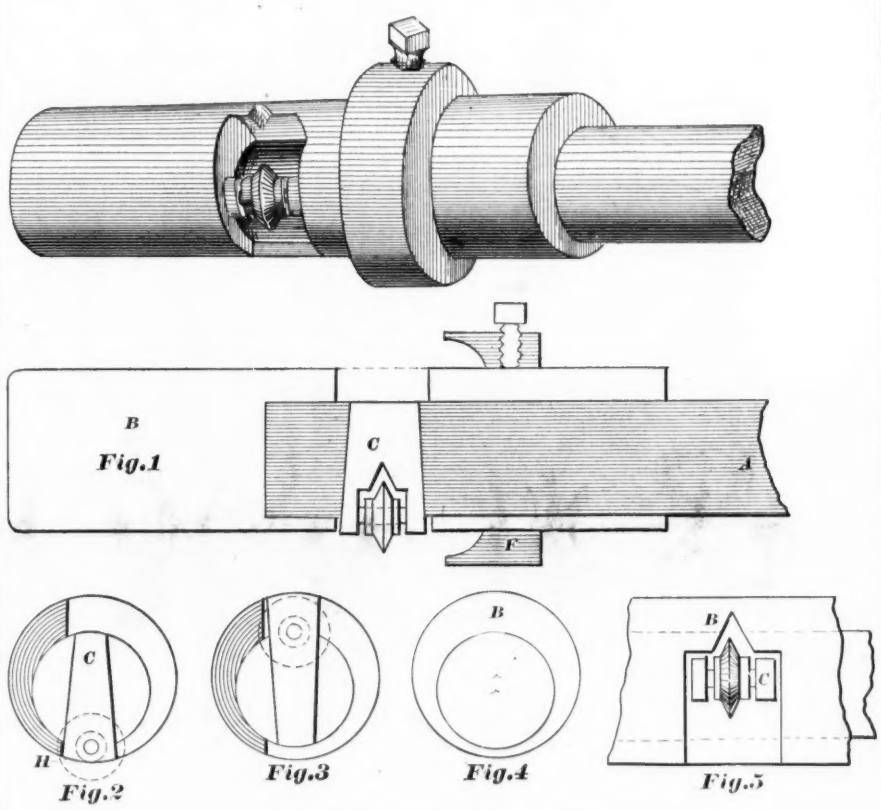
And now, on the basis of this judgment, as a sequel for "what's sauce for the goose is sauce for the gander," Mr. Reed files a bill against the Boston and Albany Railroad Company, which states that that railroad has a large number of tracks with many engines and cars, both freight and passenger, in West Springfield, and make up many trains there on Sundays, and he asks that an injunction be laid on the company restraining them from running trains on Sunday. All this is an interesting outcome of the suit which Mr. Read brought in 1884, and between this and the two true bills found by the grand jury against the company for running trains on Sunday, the courts may have something interesting in the future on the subject.

Water-wheels at Holyoke.

The Holyoke Machine Company publish a small pamphlet which gives the amount of power furnished by each kind of wheel in use in Holyoke, Mass., February 1st, 1885:

Name of Wheel.	Number.	Horse-power Furnished.
Hercules	53	10,576
Boyden	38	5,398
American	10	825
Tyler	10	311
Hunt, Waite & Flint	7	375
Risdon	6	440
Jonval	4	655
Swain	1	160
New American	1	65
Houston	1	75
Victor	2	150
Total	133	19,030

There are no overshot or breast wheels in the city, and the superiority of the modern quick-running turbine to the old-fashioned slow-moving wooden wheels has never been questioned by Holyoke manufacturers.



TOOL FOR CUTTING OFF BOILER TUBES.

LETTERS FROM PRACTICAL MEN.

Tool for Cutting Off Boiler Tubes.

Editor American Machinist:

The accompanying sketch of a tool for cutting off boiler tubes represents one in use with the best satisfaction by the Oneida Iron Works. It is not patented, nor made for sale. It will cut off a 2-inch tube by turning once and a half around, leaving the end true. In the sketch, *A* is a steel pin with the end squared so it can be turned with a ratchet or tap wrench. In a fire-box boiler it is best to use a socket wrench so the work can be done from the outside. The pin has a taper mortise cut through it to receive the cutter-carrier *C*. The cutting tool is a common wheel, such as is used in cutting off pipe. It turns on a pin. The outside piece *B* is steel, and is made to slip into the tube easily, with a hole in the end as shown in Figs. 1 and 4 to receive the pin *A*. A slot is cut in this piece, as shown, so that the cutter-carrier can be put into the mortise in the pin: after the pin is in the piece, the slot allows the pin to turn, as shown in Figs. 2 and 3. The slot in the piece must be cut as shown in Fig. 5, so that the carrier *C* will stop the pin from turning, or will carry the piece around with it, and not bind on the cutter.

To cut off a tube, the pin is turned to the left, which draws in the cutter. Then slip the tool into the tube until the collar strikes the tube slot, and turn to the right. The pin *A* will turn inside of *B* until the carrier *C* strikes the end of the slot.

The cutter is thus forced outward, and by continuing to turn the tube is cut off. Both ends cut off, the tube may be removed through the handhole.

For tools larger than 2″ it is necessary to have a feather in pin *A* that will catch in notches in *B*, then *B* can be made to turn with the pin before the full cut is taken.

About two turns are required to cut off a 3″ tube. A. E. L.

Heating By Exhaust Steam.

Editor American Machinist:

Several times of late I have read in mechanical papers, articles condemning the use of exhaust steam for heating buildings; the objection being the serious loss involved in the increased back-pressure on the engine. Now, this is a matter of sufficient importance to be looked into pretty carefully, before deciding against it; as it means the saving or the waste of thousands of tons of coal per year to the steam users of the country. I would like to ask if the "low-pressure" system of steam heating is not as successful as any other?

From what I have seen, it is the most universally applied of any. The pressure generally carried is less than five pounds, and there are hundreds of cases where the pressure carried is not enough to raise the pointer of the common high-pressure gauge from the stop-pin; varying around the atmospheric point, within a pound or two, about as often below as above that pressure. If such pressure is sufficient for heating buildings, what can be the objection to using the exhaust as that pressure?

I know of a large concern in Ohio exhausting the steam of over 200 indicated horse-power, through about 140,000 feet of one-inch pipe. Their back-pressure valve is set at three pounds, but that pressure is seldom reached. The steam is almost entirely condensed before leaving the pipes, and requires a half-hour's running before it gets around, after starting cold.

A concern in western New York sends the exhaust from a 40 horse-power engine through the different buildings as far as it will last; in this case it is all condensed, in cold weather, and only warm water escapes at the outlets.

Another concern in Buffalo, that used one boiler for the engine, and the mate to it for heating, now get along with the exhaust alone; only keeping fire enough under the heating boiler to have it ready at night when the engine is stopped. In none of these cases is the back pressure any higher than it would have been exhausting through the roof direct.

It is obvious that in such cases as these, where the steam is all condensed it would have taken just about that amount *extra* had the buildings been warmed by a separate system of live steam.

It is not the use of the exhaust steam that should be condemned, but the injudicious ways of doing it that are so often found.

The writer was lately called to doctor a sickly engine, and found a regular sample in this line. The indicated load was nearly 200 horse-power, and the average back-pressure full ten pounds higher than it should have been. The exhaust pipe was 5″ diameter, with several elbows and a 5″ back-pressure valve, through which the surplus steam was forced. As this surplus was fully two-thirds the amount used, it was not surprising that it made the engine sick, its ratio of sickness being about as one is to five, or 42 horse-power out of 200 horse-power. The engine had been condemned as unequal to its load, and a new one ordered.

The heater had been condemned because it leaked under the strain. The steam pipe was blamed also for being too small, and, I presume, had the back-pressure been suspected, they would have condemned the use of the exhaust for heating.

The prescription calls for 8″ exhaust pipe with one elbow and an 8″ back-pressure valve to be loaded to two pounds. When this is attached, the engine will be found equal to the load, the steam pipe and heater all right and the use of the exhaust a success; the only thing to regret being the cancellation of the order for the new engine. F. B. Rice.

Dunkirk, N. Y.

About Medals.

Editor American Machinist:

A recently published list of the awards made at the "Novelties" Exhibition, Philadelphia, called to mind and emphasized an editorial in a late number of your paper in which you say: "There is no longer any novelty in the medal business, and when it lost that, it lost all its value."

A cursory glance of this list shows an allotment of twenty silver medals. Of these four were awarded for photographs, two for bicycles, two for hoists; while two were for collective exhibits of machines and tools. All of them, doubtless, of unquestioned merit, but certainly devoid of that distinctive "novelty and intrinsic merit," which one, in this exhibition at least, naturally expected among the highest awards.

And then, too, what a Philadelphian tendency has this silver shower. Twenty silver medals and four-fifths of them to "our home people!"

O tempora! O mores! O Franklin Institute! N. O. V.

"Rules for Engineers and Firemen."

Editor American Machinist:

In these rules, as published by the Hartford Steam-boiler Insurance and Inspection Company, rule five will not work well in this section. It reads as follows: "Blow down under a pressure not *exceeding* twenty pounds, once in two weeks; every night would be better. In case the feed becomes muddy, blow out six or eight inches every day. When surface blow-cocks are used, they should be often opened for a few minutes at a time."

Now, I claim, this will seriously injure boilers which use these North-western waters, by coating the boilers with scale, as every time a boiler is blown down, the dirt and scale-producing elements left by the water, are baked on to the flues, and shell of boiler, by the heat left in boiler when the water has blown out, thus forming a thin scale, and the oftener it is done, the worse it is, as a layer of scale is formed each time, and very soon forms a heavy scale.

I know one boiler, in an elevator in Willmar, Minn., whose owner followed this rule, only improving on it, as he thought, by blowing down every second night, or three times a week, in consequence of which he had scale of three-eighths of an inch on his flues and crown sheet in less than six weeks; and inside of three months from time of

starting the boiler with new flues and furnace, I had to patch two places in the furnace, burnt by scale forming on the sheet, and keeping the water from contact with the iron.

Even in blowing off some of the water through the day, I claim it makes a very great difference at what times it is done, and my instructions to engineers here are to have boiler well filled with water, when going to dinner; then, on return from dinner, *before stirring the fire*, blow down one, two or more inches, as the boiler will allow, still retaining plenty of water to run safely. Do this also at supper time, allowing the boiler each time to remain from thirty to sixty minutes, without touching the fire. Every two weeks, if you find you need it, run out the water entirely, but *not till cold*, and wash out all dirt remaining in the boiler.

Allowing the water to remain all dinner or supper time (as the case may be) in the boiler, without firing, causes the sediment to settle to the bottom of the boiler, and one inch of water blown out then, contains more dirt than three inches blown out while running, as then the dirt is kept suspended in the water by action of steam-forming.

I would like to hear from any others who have had much experience with dirty or bad water, as my opinion is that a very large part of the failures of boilers here is caused by improper blowing down and off.

Crockston, Minn. J. E. M.

The "Glass Ball" Again.

Editor American Machinist:

In the AMERICAN MACHINIST of December 26, a request was made for particulars as to how my equation was formed, whereby the result 1.695+ was obtained in solving the glass ball problem by arithmetical computation.

I multiply .5236 by 16 to get the concave surface of a ball whose shell is $\frac{1}{16}''$ thick, I then divide the product by 3.1416, and extract square root of quotient, which I find to be the mean diameter of a shell .0625″ thick. This would be inside diameter of shell, if I had more glass to finish outside surface, but I have not, so I deduct .0625 from .163+ and make by the operation the inside diameter 1.57+ and then take this .0625 that I deducted from 1.63 and add it to the 1.63 and receive outside diameter 1.69+. Try the example on a ball (a shell) whose thickness is exaggerated. SAM'L J. WISDOM.

Montgomery, Fla.

[We have so many letters on this subject, that it would be impossible to publish them all. With the above we are compelled to close the discussion.]

Piston Packing.

Editor American Machinist:

I notice in a recent issue of the AMERICAN MACHINIST, Mr. Hill's advocacy of a packing ring, which he shows by sketch. To my mind this ring has two grave faults, viz., the steam will go in at one side of the joint and out at the other, and permitting the piston to drop below the center. I have used this packing with a plate riveted on the inside to prevent this, but the other fault remained.

On the Ohio river spring packing is the standard, as with it the piston can be kept up to the desired point. GEO. C. MARSHALL.

Oil Channels in Journal Bearings.

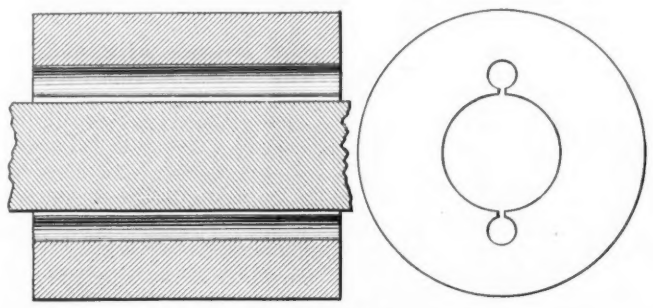
Editor American Machinist:

I wish to communicate a small matter relating to the construction of oil channels in long journal bearings formed by a continuous sleeve of metal. In such bearings the oil grooves are usually made by chipping or filing. This is not only difficult of accomplishment, but results in taking away too much of the bearing surface, and leaves the channel contracted and subject to the inevitable clogging due to the use of poor lubricating oils.

Necessity, as usual, brought about the construction shown by the cut. In the frame of my angular couplings there are two long bearings, say 10″ long and 2″ diameter; in these bearings I require large oil channels without defacing the surface of bearing more than enough to admit of the lubricant coming in contact with the journal.

To accomplish this, I drill holes diametrically opposite each other, and parallel to the axis of the bearing from end to end, and, with a thin drift, make a narrow groove communication between the bearing and holes.

It will be seen that while the oil channels are large enough for all practical purposes, leaving scarcely a chance for becoming



OIL CHANNELS.

clogged, the bearing surface is left almost complete, and this result is effected in a straightforward, practical manner.

Too much attention cannot be given to the matter of making oil channels in machinery, while, as a matter of fact, this is not infrequently the last and least attended to. Machinery costing hundreds and thousands of dollars, made by the best manufacturers, is sent out so poorly provided with means by which the lubricant should reach the surfaces, that something must come to a sudden standstill soon after the machinery is put into operation, oftentimes costing considerable time and money; good, generous leaders should branch out from the oil inlets, and all stationary collars and shoulder faces would not be so much injured if properly arranged grooves were made.

Manufacturers of machinery will do well if they carefully show up the excellent means provided by them for lubricating the various parts of their work. Employes will do better if they attend more carefully to the oiling-up process; and employers will do best if they provide lubricants of the finest quality instead of the usual method of paying as little attention to this matter as they possibly can. The subject of lubricating materials and their qualities is not, I think, sufficiently brought to notice by our technical journals. It will bear intelligent consideration until all users of machinery know the difference between lubricating mineral oils and ordinary kerosene oil, to say the least.

We may never be able to find out just why two substances having apparently the same chemical composition differ so materially in their lubricating properties, but, to be in possession of the facts is of the utmost importance, the reason why, being of secondary importance. T. R. ALMOND.

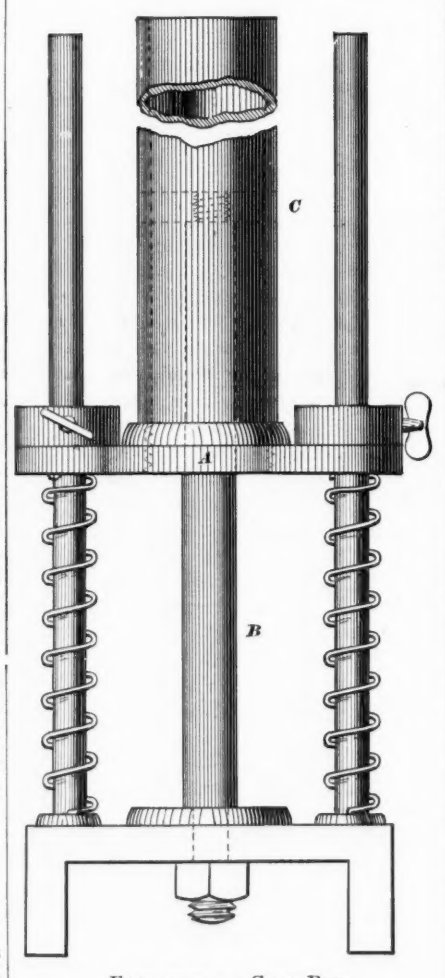
Brooklyn, N. Y.

Snap Core Box.

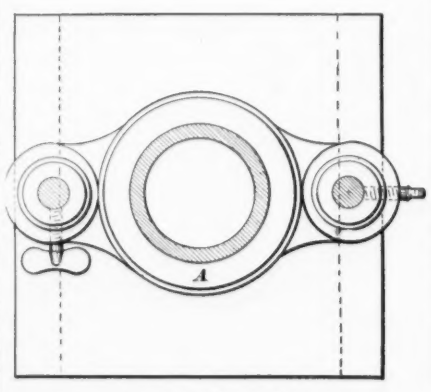
Editor American Machinist:

Some years ago I had a great many short cores to make from 1″ to 3½″ long, and it was necessary that the holes in castings should be absolutely round. Iron core boxes were the only material that would last, as the wooden box made in halves soon wears out of round, and leaves a seam, each side of core, from the frequent cleaning which the box requires when a large number of cores are made each day. Small particles of the core sand adhere to the box when opened to remove the core; this means a rough core and a rougher hole in the casting. As there were various sizes of these cores, it at last occurred to me to make what the core boys called a "snap box," as per sketch sent, by getting some brass tubing with the internal diameter of the required sizes, and fitting each size to the crosshead marked *A*, and having a standing stationary piston *B*, with end to fit internal diameter of tube as shown in dotted lines and a piston *C* for each size, threaded to screw on stationary piston. The remainder of this little contrivance, I think, will explain itself. The thumb screws are for adjusting height of piston in tube to length of core required. Ram up a core with the crosshead up to collars which are set for length required. When vented, put fingers on crosshead and depress the spring until the tube slips off, leaving the core standing on the stationary piston, and is easily removed. Upon removing the hand from crosshead *A* the tube snaps back into place, and the operation may be repeated. The advantages are that the core is round, smooth, and uniform in length, no shucking of box halves to make it oval; each descent of tube cleans it, as the gummy, sticky material used, is carried out on each core.

The box is always ready, and the interest the core boy takes in making cores with it is delightful to see, and the amount of missionary work this little machine has done in the machine and boiler shops, and wherever a round hole in the rough was a desideratum, is beyond calculation. As a boiler foreman told the writer, "castings with these round holes that *were* round" actually made the air more pure in his shop. FOUNDRYMAN.



ELEVATION OF CORE BOX.



PLAN OF CORE BOX.

Using the Same Water Twice.

Would-be "inventors" of water-wheels and other apparatus for "using the water over and over again," are very apt to be disappointed when cold blooded mechanical truth is told, but according to *The Fireman's Herald* the feat actually occurred at the residence of a family in Lansingburgh, N. Y. They were aroused by a dense smoke throughout the house. An investigation showed that the dwelling was on fire in the basement. The fire department was summoned, and after several hours' hard work succeeded in extinguishing the flames. The water supply was limited, a well and two cisterns being the only source from which water could be obtained, and these were speedily emptied by the steamer. Fortunately the cellar was water-tight and the water thrown upon the building accumulated there. When the last cistern gave out the suction was introduced into the water in the cellar and the steamer was steadily supplied from that source until the fire was put out.

Proportions for Shafting, Pulleys and Belts.

BY C. L. REDFIELD.

In designing the transmitting machinery for a shop or mill, two distinct ideas must be kept in mind; first to provide adequate strength, to avoid dangerous accidents, and second to reduce the loss of power by friction to a minimum.

We will take the second of these propositions first. The loss by friction is of two kinds; that caused by the rubbing of the shaft on the bearings, and the continual bending and unbending of the belts as they pass around the pulleys. This last loss is comparatively slight. It is least when the belts are thin, pliable and narrow, and run upon pulleys of large diameter; and it is greatest when they are thick, stiff and wide, and run upon pulleys of small diameter.

In a fight against friction, the first inquiry is, What is it, and what causes it? Friction is the resistance to motion caused by one surface rubbing on another. The force required to overcome this resistance is the product of the pressure by the coefficient of friction. The power used in overcoming friction is the product of the force by the speed. Obviously, then, to reduce the loss of power to a minimum, we must reduce the three elements, pressure, coefficient of friction and speed of rubbing surface to the lowest possible limit. It is supposed that everyone knows enough to keep down the coefficient of friction by smooth surfaces and proper lubrication.

The pressure on the journals is made up of two elements; the weight of the shafting and pulleys, and the pull of the belts. The pressure caused by belt pull is, in a majority of cases, greater than that caused by weight, and claims attention first. An ordinary belt 1′ wide running 800 feet per minute will transmit with ease 1 horse-power. Probably 75 per cent. of the belts to-day run at a less speed than this, yet a belt may run at 6,000 feet per minute, hence a 1″ belt may transmit 7½ horse-power. Suppose in any line of shafting at present driven by a 10″ belt, we could by any means double the speed of the belt, we might reduce the width to 5″, thus reducing the friction caused by the belt pull to one-half, besides saving more than one-half the price of the belt.

There are two ways of increasing the speed of the belt, one by increasing the diameters of the pulleys, and the other by increasing the speed of the shaft. If we double the speed of the shaft, we may, it is true, reduce the resistance caused by belt pull to one-half, but we have at the same time doubled the speed at which the resistance is moved, hence there is no gain, but rather a loss, for we have not only doubled the speed of the resistance caused by belt pull, but we have also doubled the speed of that caused by the weight of shafts and pulleys, from which we have taken nothing. Obviously, then, the better way is to double the diameters of the pulleys, as that means has no attendant loss except possible

by a slight increase in weight. It does not necessarily follow that increasing the belt speed by increasing the speed of the shaft will always occasion a loss; on the contrary it may be productive of a decided gain, but not so great as could be obtained by increase of pulley diameters. In many cases where heavy belts are carried on light shafts, the deflection of the shaft is so great as to cause a grinding action on the journals. In such cases an increase of belt speed by any means is preferable to the existing state.

As to the loss of power occasioned by size and weight of shaft, take, for instance, a 1″ and a 2″ shaft. If they both run at the same number of revolutions per minute, it is obvious that as the 2″ shaft has twice the circumference of a 1″ shaft, the resistance due to friction must be moved through twice the space, hence takes twice the power other things being equal. But as a 2″ shaft weighs four times as much as a 1″ shaft, the friction due to weight is four times as great, therefore it takes eight times as much power to drive a 2″ shaft 100 revolutions per minute as it does a 1″ shaft. But as a 2″ shaft is eight times as strong as a 1″ shaft they are upon an equality when simply turning, relieved of all pull of belts or weight of pulleys. This would be strictly true were it not that lubricants have a certain amount of viscosity, which influences the amount of resistance to be overcome irrespective of weight. We may, therefore, with the same power drive a 1″ shaft eight times as fast as a 2″ shaft.

On account of this viscosity of oils, there is a slight advantage in favor of the heavier and slow-running shaft.

Shafts are rarely run without belt pull, therefore if the belt pull remains the same it requires four times as much power to drive the extra load at 800 revolutions per minute on a 1″ shaft as it does at 100 revolutions on a 2″ shaft, because the speed of the rubbing surface is four times as great, and the advantage is in favor of the larger and slow-running shaft. If the pulley diameters remain the same in both cases, then the belt speed of the quick-running shaft is eight times as great.

We may, therefore, make the belt, and hence the pull and resultant friction, one-eighth as large, and the advantage is with the quick running shaft as two to one for this part of the friction. But if we could obtain the same belt speed on the slow-running shaft by making the pulley eight times the diameter, without too much weight, then the advantage is, as in the first case, in favor of the slow shaft as four to one for the friction caused by belt pull.

From the above investigation it will be seen that the size of the shaft does not make any material difference in the amount of power consumed, provided that in all cases the power transmitted bears the same relationship to the ultimate strength; also, that the greatest amount of saving can be made by making the pulley diameters as large as possible, and that a further saving can be made by increasing the speed of the shaft, at all times keeping the width of belt and diameter of the shaft at the lowest possible limit. In other words, every increase of belt speed is accompanied by a decrease of loss by friction if belts and shafts are correspondingly reduced.

The strength of shafting next claims our attention. To know that most of the shafting in shops at present is too weak, it is only necessary to pay a visit to the scrap heap of some of our repair shops, and look at the bent and twisted shafts, every one of which means an accident, many of them probably with fatal results to the workmen. To avoid any possible accident to the shaft, it should be so strong that in case the belt gets caught on the shaft while fast to some other object, the belt will break and leave the shaft uninjured. It is comparatively a trivial matter to lace a broken belt, but it is quite another thing to put up a new line of shafting that has been pulled down or bent out of shape. Obviously, then, the diameter of the shaft, and the distance between bearings should bear some definite relationship to the tensile strength of the belt it is intended to carry. If we assume a factor of safety of 2, which is sufficient in a case which provides only for maximum accidents, then

$$D^3 = \frac{T\,W\,L}{560}$$

where D = the diameter of shaft; T = the tensile strength of belt per inch in width; W = width of belt in inches and L = distance in feet between bearings. The following table has been calculated from this formula, supposing that the belt will break at a pull of 200 pounds per inch of width:

TABLE SHOWING DIAMETERS OF SHAFTS WHEN WIDTH OF BELT AND DISTANCE BETWEEN BEARINGS ARE GIVEN.

Width of Belt, in Inches.

Distance between bearings, in feet.	TW =	1	2	3	4	5	6	7	8	9	10	11	12
		200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400
	2	.89	1.13	1.27	1.42	1.53	1.62	1.70	1.79	1.86	1.92	1.99	2.05
	3	1.03	1.27	1.48	1.62	1.74	1.86	1.96	2.05	2.13	2.20	2.26	2.34
	4	1.13	1.42	1.62	1.79	1.92	2.05	2.16	2.25	2.34	2.43	2.50	2.58
	5	1.21	1.53	1.74	1.92	2.06	2.20	2.32	2.43	2.52	2.60	2.69	2.78
	6	1.27	1.62	1.86	2.05	2.20	2.34	2.46	2.58	2.68	2.78	2.86	2.95
	7	1.36	1.70	1.96	2.16	2.32	2.46	2.60	2.71	2.82	2.92	3.01	3.10
	8	1.42	1.74	2.05	2.25	2.43	2.58	2.71	2.84	2.95	3.06	3.16	3.25
	9	1.48	1.86	2.13	2.34	2.52	2.68	2.82	2.95	3.07	3.18	3.28	3.38
	10	1.53	1.92	2.20	2.43	2.60	2.78	2.92	3.06	3.18	3.29	3.40	3.50
	11	1.58	1.99	2.26	2.50	2.69	2.86	3.01	3.16	3.28	3.40	3.51	3.61
	12	1.62	2.05	2.34	2.58	2.78	2.95	3.10	3.25	3.38	3.50	3.61	3.72

This table has not been extended far on account of the uncertainty of the value of T, as belts vary in tensile strength. As a rule wide belts are thicker, and consequently stronger per inch of width than narrow ones. If the tensile strength of a particular belt is known, then the value of T W should be used in applying the table; thus, if a 4″ belt is known to have a tensile strength of 250 pounds per inch in width, then we should look under the column of T W = 1000 and not under the column for 4″ belt, If some belt manufacturer will institute a series of experiments to test the actual strength of their various belts, and from these values construct a table like the above, they will confer a favor on the mechanical fraternity and produce a good advertisement for themselves. Although the sizes of shafts given in this table are larger than those in ordinary use, they are the minimum sizes that should be used where there is only one belt between bearings and considerably less than should be used when two or more belts come between bearings.

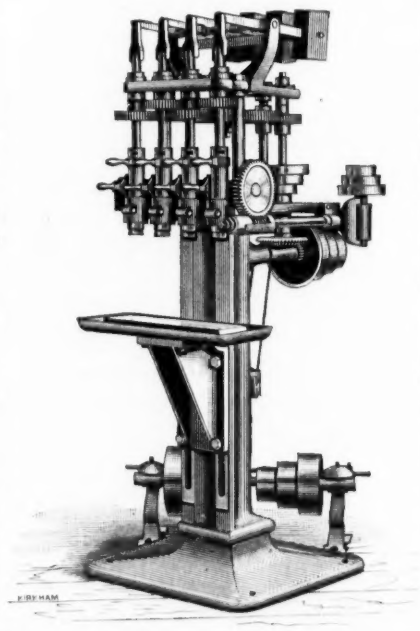
A large per cent. of the power required to overcome friction may be saved by placing the bearings near together and making the shaft small. Thus for a 6′ belt and bearings 12 feet apart, it will be seen that a $2\frac{5}{16}$″ shaft will be required; whereas, if an extra bearing be put in, making them 6 feet apart, then a $2\frac{7}{16}$″ shaft may be used and still have a larger margin of strength left than in the first case. This means a saving of 17 per cent. of the power required to move that shaft, because the circumference of the shaft is that much less, and consequently the resistance due to friction has to be moved through that much less space. In addition to this the $2\frac{7}{16}$″ shaft weighs 30 per cent. less than the $2\frac{5}{16}$″ shaft, hence this part of the friction is correspondingly reduced. The same holds good for all proportion of belts and shafts.

A 1′ shaft running 100 revolutions per minute will transmit 1 horse-power, and a 1″ belt traveling 800 feet per minute will transmit an equal power. From this equality we may build up the formula 8 R D^3 = F W where

D = diameter of shaft, in inches.
R = revolutions of shaft, per minute.
W = width of belt, in inches.
F = speed of belt, in feet per minute.

If we take R = 1 then F will be the circumference of the pulley in feet, required to make the belt transmit the full power of the shaft. Taking the case of the 6″ belt and $2\frac{7}{16}$″ shaft, the pulley will be found to be about $6\frac{1}{2}$ feet in diameter, and for the $2\frac{5}{16}$″ shaft over 11 feet. As no one is likely to put such a pulley on such a shaft, it will be seen that where shafting is designed to resist accidents, the torsional strain may generally be neglected. However, in long lines of shafting, with a large number of belts, the torsional strain may be brought up near the safe limit. Under these conditions there is just as much reason for a safety-valve on the shafting as there is for one on a boiler. In such a case if a large belt gets caught in a pulley something must give away. The best kind of a safety valve to prevent torsional accidents is to make the shearing strength of the bolts in the coupling less than the torsional strength of the shaft and put the coupling next to a bearing, and on the side farthest away from where the power transmitted to the shaft. It takes but a few minutes to replace bolts sheared off in this manner, if a supply of them be always kept on hand for just such emergencies.

In arranging the belts leading from the main line of shafting to the counters, those pulling in an opposite direction should be placed as near each other as practicable, while



FOUR-SPINDLE DRILL PRESS.

those pulling in the same direction should be separated. This can often be accomplished by changing the relative positions of the pulleys on the counters. By this procedure the shaft not only has an additional support in case a belt gets caught, but much of the friction on the journals may be avoided.

By paying particular attention to the principles set forth in this article, fully one-half of the power usually consumed in transmission might be saved, and we should have fewer persons in the position of the manufacturer who disgustedly remarked that he was "paying more for turning shafting than for doing work."

Next Meeting of the Michigan Engineering Society.

We are indebted to R. C. Carpenter, secretary, for the following particulars of this society:

The next meeting of the Michigan Engineering Society is to be held at Ann Arbor, January 26–30, 1886. The following programme has been arranged: Tuesday 26, 2 P. M., reports of president and various permanent committees; appointment of new committees and organization of sections; 7.30 P. M., address of president, subject, Technical Education; Wednesday, 9 A. M., meeting of standing committees to pass on papers to be read; 9.30 A. M., meeting of the society in three separate sections as follows: Section A, Surveying; section B, Civil Engineering; section C, Mechanical Engineering; 2 P. M., excursion to various points of interest at University; 7.30 P. M., address before the whole society; Thursday, 9 A. M., continuation of excursion; 2 P. M., meeting of societies in three separate sections; 7 P. M., meeting of standing committees; 7.30 P. M., address before whole society, general session.

This society now numbers nearly two hundred members, many of whom reside in other states, and a large meeting is anticipated. The members are not confined to the profession of civil engineers and surveyors, but mechanical engineers are also included—in fact, all those interested in the industrial arts. At the coming meeting all those interested in the industrial arts, whether having a membership in the society or not, are invited to be present. Anyone desiring to attend can secure reduced rates on all railroads by writing to the secretary for a certificate to be used in purchasing the ticket.

The following are among the subjects of papers to be read before the mechanical section: Ice Machines, F. M. Dunlap, Detroit; Pile Drivers for Railroad Work, W. L. Clements, Bay City; Novel Experiences in Mechanical Engineering, Frank E. Kirby, Detroit; Paper by Jessie Smith, of Detroit, and by Prof. M. E. Cooley, of Ann Arbor; Saw Mill Machinery, by D. K. Allington, East Saginaw.

Following are the officers of the society: Prof. J. B. Davis, Ann Arbor, president; Geo. E. Steele, Grand Traverse, vice-president; R. C. Carpenter, Lansing, secretary. Executive committee: Prof. M. E. Cooley, Ann Arbor; W. S. Russell, Detroit; C. E. Hollister, Laingsburg.

New Four-spindle Drill Press.

The engraving represents this machine, which is made by E. E. Garvin & Co., 134 Center street, New York. The four spindles are driven by gearing, and each has independent automatic feed and adjustable trip. The spindles are counterbalanced by means of levers, shown at the top of the machine. When the feed pinion is out of clutch, the spindles can be raised or lowered by the direct movement of the handle, fastened to the shell forming the lower spindle bearing.

The trip mechanism is a wedge, adjustable in a slot in the shell coming in contact with a projection upon the clutch lever shown in the engraving. This forces the pinion out of contact with a clutch-piece fastened to feed shaft, leaving the spindle free.

The table is adjustable, vertically, upon the face of column, by loosening four bolts. The table has oil grooves, communicating with an oil pump at the back column. The weight of the machine, complete, with countershaft, is 1,200 lbs.

The metric system of weights and measures was adopted enthusiastically in many laboratories when first introduced, but is now said to be rapidly losing ground. It has been the cause of many serious errors. The fact that the misplacement of a little dot will turn a comparatively harmless dose of medicine into one having a deadly poisoning power, bears strongly against it. A well known druggist, who formerly advocated the system, has decided it to be unsuited to such requirements, and this will have much influence with many people who felt the defects of the system, but did not like to reject it.

The following simple and easy test for glue is given: A weighed piece of glue (say one-third of an ounce) is suspended in water for 24 hours, the temperature of which is not above 50° Fahr. The coloring material sinks, and the glue swells from the absorption of the water. The glue is then taken out and weighed; the greater the increase in weight the better the glue. If it then be dried perfectly and weighed again, the weight of the coloring matter can be calculated from the difference between this and the original weight.—*Manufacturer and Builder.*

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Fictitious Profits in Manufacturing.

Manufacturers are frequently slow to institute improvements in their own works as long as profits are reasonably satisfactory under existing methods; often they will only do so when profits cease altogether. Instances are not rare in which a manufacturer who has been protected by patents, or by prestige, finds upon abrupt or gradual cessation of this protection that another will start in opposition, and be able to undersell him because of better methods of doing work. Long experience in certain lines of work does not always mean the acquirement of that familiarity which results in rapid production; it frequently means getting into ruts that retard progress. The moral would seem to be to employ a certain amount of talent in improving methods, and to spend money for improved machinery whenever it can be demonstrated that it will be a good investment to do so, notwithstanding returns from the business are good. If the profits are too large for the conscience, there are always unobjectionable ways of distributing them.

The proprietor of a machine shop, beguiled into keeping to old plans and old tools through lack of active competition, is likely, when such a course is forced upon him, to find getting on a modern working basis hard work and an expensive operation. The spirit of constant progress is lacking, and seems almost to get into the tools. Improvement in this respect is never easy except when it is part of the general system. In addition to this, the cost in money of the universal change needed is apt to be alarming.

One other feature of the case is sometimes overlooked. That is this: A machine business may have been carried along in an easy way, showing fair profits: and when general changes are imperative, that ought to have been made from time to time, it is likely to be found that the accumulated profits are not sufficient to meet the cost of the rehabilitation necessary to a continuation on a paying basis. As it stands, the plant is good for nothing for the present business, because it cannot be made to pay; it will sell for other purposes for a fraction only of its cost, and the supposed profits of the business disappear abruptly. In the present state of the art of machine manufacture, nothing but the best tools and progressive methods are likely to go with permanent success. Profits which appear through temporary advantages and a general decline of plant are likely to disappear when changes become imperative.

Elevated Railroad Amenities.

The elevated railroad corporations of New York and Brooklyn seem to be about equally inclined to believe that the public (which grants them their charters) has no rights that they are bound to respect.

The Brooklyn corporation recently undertook to practically withdraw "rapid transit" from the sparsely settled portion of their line, unmindful of the fact that rapid transit is the one thing needed to fill up the suburban wards of the city with population. The people very properly refused to vacate the regular cars or enter the "shuttle" trains, and the obnoxious order was finally withdrawn, the company backing down in a way the reverse of graceful. Whatever the real motive behind the company's action may have been, the attempt was discreditable to the corporation, and an invasion of the rights of the public.

In New York some of the engineers respectfully, and without heat or threats of any kind, so far as we are informed, petitioned the company to rectify certain matters claimed to be inequitable. Right-minded employers are usually willing to confer with sober, faithful employes as the best means of adjusting differences. Not so with the New York elevated railroad magnates. In advance of any official hearing of the alleged grievances, the general manager coolly issued an order virtually stigmatizing the petitioning engineers as the reverse of "loyal," and summarily closing to all travel two of the elevated railway lines. This needless attempt to whip their employes over the heads of the public, whether it accomplishes the end aimed at or not, is an outrage upon the community which will not improve the standing of the company.

Answering Questions.

A firm of newsdealers sends us a mechanical question, which we are requested to answer in our reading columns. They say the inquiry comes from one of their customers, who buys the AMERICAN MACHINIST each week over their counter, and that fact is mentioned as a reason why we should give space to the reply. We wish to call special attention to the fact that our Questions and Answers columns are always open to matters that come within our province, and are of general interest. We do not desire to limit our field of usefulness by higgling over the inquirer's right to ask a question, the reply to which is likely to give information to others. We do not ask whether the inquirer gets his AMERICAN MACHINIST from us direct, or whether he gets it from a local newsdealer, or whether he gets it at all. That he asks the question is accepted as proof that he reads the paper, and that is all we care to know, except that we desire him to sign his name for reasons that should be obvious. The AMERICAN MACHINIST has the advantage of being, not nominally, but really, "for sale everywhere by newsdealers," and the reader who buys the paper each week of a newsdealer, and pays five cents a copy for it, in effect renews his subscription every week, and is therefore just as much of a subscriber as if, like some foreign Governments, the payment of his subscription was made to cover several years in advance.

We continue this week the publication of the replies from machinery establishments to our annual inquiry regarding the state of trade and the outlook for the new year. Our last issue contained letters from over fifty establishments, and gave an excellent bird's-eye view of the business situation. The additional reports which we publish this week tend to confirm the hopeful view there expressed, covering, as they do, a number of departments not previously represented, as well as a wider range in the same departments. Exports of machinery in more or less active movement are referred to by some of the concerns reporting, and this is a direction in which, doubtless, many other shops could look to good advantage.

Small Steam Yachts.

There is reason to believe that next season will see a good deal of interest in small steam yachts, large enough for use in fishing, and for pleasure purposes. Already there is a good deal of inquiry in relation to such boats, and more than the usual number of small yachts will undoubtedly be built this winter. What is needed to bring such vessels into popular use is a boiler using some other fuel than wood or coal, and in which steam for running can be generated in about five minutes from the time of starting fires; then the supply of fuel should be self-regulating. Possibly such motors are in existence; in that case, they should be adapted to boats of twenty to twenty-five feet in length. Petroleum may be found to answer all purposes, or perhaps some kind of gaseous fuel may be used. Whatever is used, the bother of carrying and using coal on such small boats should be overcome. This style of yacht will eventually become more popular than sailing boats. They could be made comparatively inexpensive, and their use would be healthy recreation. There is probably room for a good business for some one who will give the subject the necessary attention. With the proper kind of engine and boiler, the time of preparing for a trip would be but a few minutes, and a leisure afternoon could be profitably spent by a busy man. While, to become popular, such a boat must be reasonably cheap, it must at the same time be easy of operation, and the machinery not liable to derangement. One trouble with small steam yachts is the length of time required to get ready for a start, and something is quite sure to require "fixing." Then a good deal of time is lost in getting up steam, and after starting, the fire requires a good deal of attention. The trouble and loss of time in getting ready is so great that a man with only Saturday afternoon at his disposal has no use for an ordinary small steam yacht.

The general superintendent of a Western railroad proposes to discount accidents by making it imperative upon employes to carry accident insurance. He furthermore notifies employes that "orders will be accepted by the cashier for monthly or quarterly payments of premiums." Accident insurance may be a good thing for railroad men—it may be an especially good thing on this particular road—but the thought suggests itself that this is a matter which the men can best decide for themselves, or, to put it just as it is, that it is in no way the business of a railroad superintendent whether or not the employes insure against accident. We do not believe his employes are in need of his fostering care to the extent indicated.

According to the press dispatches, the United States Court has ordered the Missouri and Arkansas division of the Texas and St. Louis road to be sold on February 22. The total indebtedness of the road is $7,200,000; the receiver was allowed compensation at the rate of $18,000 per annum; his attorneys, $18,000; the master, $15,000, and the complainant's attorneys, $25,000. The road, it is said, will be extended to St. Louis.

The only real prospects we can see for the extension of the road is, that the receiver, and his subordinates, expect to save enough from their salaries to pay for the work. For using up anything that may be left from an unfortunate railroad enterprise, there is nothing quite equal to putting it into the hands of a receiver. There is seldom enough left to trouble competitors.

Nothing more pathetic has ever been portrayed by the most gifted novelist than the efforts of the miners to save their imprisoned co-laborers — twenty-eight in number—at Nanticoke, Pa. These men were imprisoned by the caving in of the mine, and their comrades worked for their deliverance with an energy born of despair, surrounded by wives, sisters, brothers, mothers, and children, of the imperiled ones, until a further caving in destroyed every hope. If it is true, as reported, that the mine-owners will divide $40,000 among the families of the buried miners, it is in every way creditable to the company. There is no evidence that the accident was the result of special carelessness or lack of ordinary precautions. Unquestionably, accidents in coal mines could be guarded against much more effectually than they are, but it would be at very considerable expense, which competition will not admit of. It can hardly be brought about except by a general law. Any State compelling this, except to a very limited extent, would discriminate against its own citizens in favor of those of another State where the laws were easier in this respect. So long as men are willing to engage in coal-mining as at present carried on, it will be difficult to make the work materially less dangerous. Few of us realize the cost in life of that which we use so commonly as coal.

The Piece-price System in New Jersey Prisons.

According to Keeper Laverty the piece-price system in New Jersey State prisons is working in every way more satisfactorily than the contract system, which it displaced. There are two reasons for this; one is, because it is a better system, and the other, because Mr. Laverty, under whom the system was established, at Trenton, had no prejudice against its working. He was honestly in favor of the system, at least so far as to give it a fair trial. Those opposed to the system, or in favor of the contractors' ring, try to make out that the earnings to the State are less than by the contract system; but Mr. Laverty effectually disposes of their arguments by showing that the old system, being peremptorily abol-

ished four months' time were consumed in getting to work under the new one. The discipline, Mr. Laverty says, is better, and the industries, having greater scope, may be better suited to individuals, while their diversity provides for the least injury to outside workmen in any particular branch.

Questions and Answers.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common-sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials, nor location will be published.

(25) E. C., Newark, N. J., asks: What metal in the form of a half-inch round bar 2 feet long will expand and contract the most from variations in temperature? *A.*—Zinc.

(26) J. E. asks: What is used to hold the emery together in making solid emery wheels? *A.*—Glue is sometimes used, also rubber, and various cements, the exact composition of which are trade secrets.

(27) Pattern-maker, Nixton, Wis., asks for a composition or white-metal alloy for patterns, which *will not shrink*. *A.*—Type metal will answer; or 10 oz. lead, 6 oz. bismuth, and 4 drachms of antimony.

(28) R. M. A., Fredonia, N. Y., asks: 1. What will dissolve common rubber, such as rubber shoes? Bisulphide of carbon is the best solvent of rubber with which we are acquainted. 2. Is there any objection to annealing steel in lime? *A.*—No. It is much valued by some steel workers for that purpose.

(29) J. A. M., Petrolia, ——, writes: I have an engine 14″x20″, running 160 revolutions per minute. The steam ports are 1 in.; bridges, ⅞ in.; exhaust port, 1⅞ in.; travel of valve, 3½ in. What should be size of valve for economy of fuel; also for most power? *A.*—You neglect to give length of ports, and steam pressure. On general principles, we should say that you would get good results by making outside lap ⅞ in., and inside lap 0.

(30) J. J. H., Philadelphia, Pa., asks: What is the best method of putting up a line of shafting when one piece is 3″ in diameter and the other pieces 2″? *A.*—Get out half-round pieces of wood, equal in diameter to the different pieces of shafting. Make a line lengthwise exactly in the center of the flat side, put one of these prepared pieces in each box and adjust to line, and level by a silk or gut line and a good spirit-level and straight-edge. This is the every-day method of aligning shafting. The *best* method is to do the work with a transit.

(31) C. E. B., Philadelphia, Pa., writes: We have a small injector for our boiler, and also a small steam pump which pumps the water through the heater. The condensation from the heater runs into a tank, in which is the suction of the pump, so that we pump warm water at the start. Would you advise using the pump or the injector? *A.*—If in both cases the water passes through the heater we should say that you might satisfactorily use either, or use them alternately, so as to always have two means of feeding in condition to work.

(32) W. Z. B., West Milford, Mass., writes that he does not understand Mr. State's solution of his rack-cutting problem. He says, "I do not clearly see how he gets his divisor .002." Mr. State says: "A 16″ pitch requires a horizontal movement of .196. The screw being five threads to the inch, which, multiplied by 100 (the number of teeth in the gear) equals 500, therefore every tooth on the gear represents .002 inch." *A.*—The teeth of a 16″ pitch-rack are .196″ from center to center. To move anything connected to the 5″ pitch screw one inch youmust turn this wheel (of 100 teeth) five turns, hence every turn represents an advance of 1-5th=.2″, and every tooth .2÷100=.002 inch.

(33) A. K., Clear Stream, L. I., writes: 1. The high-pressure cylinder of our engine gets stained with the cylinder oil. Can it in any way be prevented? *A.*—Only by keeping the oil from coming in contact with the bright work of the cylinders. 2. How can I clean the black walnut lagging of the cylinder which has become burned and oil stained? *A.*—There is no way to restore the original beauty of the wood, but a liberal application of a strong alkaline solution will remove much of the oil, and a coat of shellac will then make the wood look much better. 3. In what issue of the AMERICAN MACHINIST is reference made to Colt's Disk Engine? *A.*—It was illustrated in the issue of Dec. 30, 1880, also described March 24, 1883.

(34) L. H., New York, writes: 1. We heat our buildings by exhaust steam, and the condensed water is carried into a tank, from which we feed the boilers. Do you think the cylinder oil will injure the boilers? *A.*—There is some danger of its doing so. 2. How can I separate the oil from the water in the tank, which is of a temperature of from 125 to 150 degrees Fahrenheit? *A.*—To our knowledge, the best method is to use a large tank which will allow the water to "settle," or separate from the oil, which will, to a great extent, float on top of the water, and may be got rid of by the liberal use of a surface blow-off. The feed-pipe should take water at a point near the bottom of the tank, but not so near the bottom that it can get any of the sediment which is deposited there.

(35) C. W. C., Lowell, Mass., writes: I have two solid corundum wheels 14″ diameter, 4″ face. I wish to run both wheels on the same frame. Of what size should the collars or flanges be made in order to be perfectly safe. *A.*—Emery wheels, as now made by first-class manufacturers, do not depend, to any great extent, for safety upon the size of the collars. The wheel itself is made of sufficient tenacity to withstand the centrifugal force at correct speeds. Concaving the inner sides of the collars and turning the wheels to fit, is one method of utilizing a brittle wheel, and may always be regarded as a factor of safety with any wheel. A washer of some soft material, like rubber, should be placed between the wheel and flange in all cases, and it may be regarded as a safe rule to make the flange one-third the diameter of the wheel, but in jobshop practice 4″, and all sizes up to 14″ wheels, are used upon the same shaft, between a pair of 3″ collars.

Business Specials

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

T. M. Parker, Steel Stamps, Stencils, Hartford, Ct.

J. Clayton, Air Compressors, Rock Drills, 43 Dey st, NY

Edw. Sears, Wood Engraver, 48 Beekman st., N.Y.

Steel Name Stamps, etc. J. B. Roney, Lynn, Mass.

Tack, Wire and Shoe Nail Machinery. Wm. A. Sweetser, Brockton, Mass.

Steel Shank, Wire Nail, Shoe Nail and Tack Machinery. Keith & Trufant, Campello, Mass.

Tack and Wire Nail Machinery, made by the Willets Mfg. Co., Providence, R. I.

The Best Upright Hammers run by belt are made by W. P. Duncan & Co., Bellefonte, Pa.

Light articles built to order by the American Sewing Machine Co., Philadelphia, Pa.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Pattern and Brand Letters. Vanderbergh, Wells & Co., cor. Fulton and Dutch sts., New York.

Patent Attorney and Expert. Machine designs and details. Wm. H. Weightman, 82 Astor House, NY

Foot-power Machinery, for workshop use, sent on trial if desired. W. F. & Jno. Barnes, Rockford, Ill.

Lyman's Gear Chart. How to Lay Out Gear Teeth. Price, 50c. E. Lyman, C. E., New Haven, Conn.

Second-hand Engine and Speed Lathes. Send for list to P. O. Box 1700, Boston, Mass.

Machines to form and bend steel and iron; run by power. Williams, White & Co., Moline, Ill.

"How to Keep Boilers Clean." A book mailed free, by James E. Hotchkiss, 86 John st., N. Y.

Drop presses and other special tools, manufactured by Williams, White & Co., Moline, Ill.

Improved Labor-saving Upright Drills, 20-in. to 36-in., inclusive. Currier & Snyder, Worcester, Mass.

Selden Packing, for stuffing-box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., NY

Engine Lathes, Hand Lathes, and other fine tools, Assortment large; prices low. Frasse & Co., 62 Chatham st., N. Y.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocum & Son's Shafting Works, Drinker st., Philadelphia, Pa.

E. Merritt & Co., Brockton, Mass., established 1859, only manufacturers of a complete line of Tack and Nail Machinery. Send for circulars.

Files recut without drawing temper, about one-half usual prices; samples recut free; prices on application. The Acme Co., Collinsville, Conn.

Curtis Pressure Regulators, Curtis Return Trap, Curtis Damper Regulator. See Jan. 2, p. 13. Send for circular No. 17. Curtis Reg. Co., Boston, Mass.

"Complete Practical Machinist," $2.50; "Mechanical Drawing Self-taught," $4. Books for workmen. Joshua Rose, Box 3306, New York City.

Kellam's Pressure Regulator—used in heating system of 11-story building, Madison ave., N. Y.—saved, last season, $2,000 over previous season. Hine & Robertson, 12 Cortlandt, st., New York.

Manufacturers in United States desirous of starting a branch of their business in Canada to advantage, please address for further information, R. Drummond, Sec'y Board Trade, Stellarton, N. S.

"Locomotive Engine Running and Management." By Angus Sinclair. Gives full directions about handling and repairing locomotives; instructs how to design valve gear and set valves; Westinghouse air-brake explained by aid of engravings. Price, $2. For sale by "National Car Builder," 187 Dearborn st., Chicago, Ill.

Every young man who aspires to be either a mechanic, merchant, or manufacturer, owes it to himself that he become thoroughly familiar with the writings of Chordal. John Wiley & Sons, 15 Astor Place, N. Y., have issued a new and enlarged 12 mo. edition of "Extracts from Chordal's Letters." Handsomely bound in cloth, with over 50 illustrations. Price, $2. Discount of 25 per cent. on orders for five or more copies.

Manufactures

The Birmingham (Ala.) Chain Works are setting up their machinery and getting ready to start.

The rolling-mill of Schall, Steasy & Co., at York, Pa., is being enlarged by the addition of a new frame structure. Two new double furnaces will also be erected.

W. W. Briggs, of New Lisbon, Ohio, has purchased the tool works at that place, and will remove the machinery to new buildings to be erected for that purpose at Findlay, Ohio.—*New Enterprises.*

H. E. Picket, New Castle, Pa., and a company, have purchased an old mill, which they will remodel, put in new machinery, and start as soon as possible as a tube factory.

The Middletown Paper Company, Middletown, Ohio, will enlarge and improve its mill. A paper mill, to be located at Seneca Falls, N. Y., is projected, but has not been definitely determined upon. *Paper Trade Journal.*

J. P. Witherow is erecting a building for the manufacture of the Heine water-tube boiler at New Castle, Pa. The works will be equipped with approved hydraulic flanging and rivet machinery. The building will be 80x180 feet.

Hillis, Goldbach & Co., 22d st., Pittsburgh, Pa., will erect a large tack factory at once. Will put in 150 machines and employ 400 men, and Marland, Neely & Co., Pittsburgh, South Side, will make extensive additions to their nut factory in the spring, doubling their capacity.—*New Enterprises.*

The Southwark Foundry & Machine Co., of Philadelphia, has arranged with Charles H. Willcox for the sale of its engines, Bessemer plants, gas apparatus, pumping machinery, etc., etc., in South Carolina, Georgia, Alabama, and neighboring States, with office at 2 and 4 So. Pryor st., Atlanta, Ga.

The Bowdoin Paper Company will get out the material this winter for their dam at Lisbon Falls, Me., the construction of which will be commenced in the spring. They propose to invest from $500,000 to $1,000,000 in their new pulp and paper mill plant at that place, the town of Lisbon having voted to exempt them from taxation for ten years.—*Industrial Journal.*

The firm of J. Stevens & Co, Chicopee Falls, Mass., manufacturers of fire-arms and machinists' fine tools, have sold out their business to a corporation just formed under the name of J. Stevens Arms & Tool Co., with the following officers: Joshua Stevens, president; William B. Fay, Joshua Stevens, George S. Taylor, directors; Irving H. Page, secretary; James E. Taylor, agent and treasurer.

M. Diamond, formerly of the firm of Williams & Diamond, Flushing, N. Y., and more recently of Brooklyn, has accepted the position of superintendent of the hand and drop-forging department of the Eames Vacuum Brake Co.'s works, at Watertown, N. Y. The company propose to enter the drop-forging business quite extensively, both for their own work and for such special work as may in time come to them.

A movement is on foot in Dexter, Me., to tear down the old Eldridge planing and moulding mill—a regular fire-trap in the heart of the village—and erect on its site a large brick building suitable for some kind of manufacturing purposes. Mr. Eldridge offers to dispose of his property at a very low figure, in which event he would remove his business to the lower part of the village, where the combustible nature of his establishment would not endanger the property of his neighbors.

Charles H. Besley & Co., 175 and 177 Lake street Chicago, Ill., favor us with a copy of their "Extra 'C' Catalogue," January, 1886, containing 184 pages of finely illustrated description and price-lists of manufacturers' and machinists' hardware, platers' polishers' and grinders' supplies, and a line of goods for the mechanical fraternity generally. The superiority of most of the engravings in this pamphlet is at once noticed, and the advantage of having first-class illustrations in a publication of this kind is strikingly apparent.

Col. W. F. M. McCarty, care of National Tube Works, McKeesport, Pa., has closed a contract for erecting gas works at Washington, D. C., to make gas from water. Will need a large line of supplies. The Williams Engine Company, of Chicago, Ill., has been incorporated. Capital stock, $50,000. A. C. Sheldon, Charles H. Mitchell, 78 Dearborn street, and Edwin F. Williams, incorporators. The New Process Twist Drill Co., of Portland, Me., has been incorporated. Capital stock, $60,000. Henry S. Hart and H. A. Cushman, Taunton, Me., incorporators.—*New Enterprises.*

Philipsburg, N. Y., will build water-works on the "Marble Hill Plan," which means a reservoir of 2,000,000 gallons capacity at an elevation of 285 feet, and supplied by an engine that can fill it in twenty-four hours, pumping from the Delaware river. The contract for the pipe was let, and the engines yet only remain to be decided on. The delivery of the pipe will commence in January, and it is confidently expected that the works will be in operation by July or August, at the latest. The company will probably lay the pipe itself, and contract the reservoir, engine-house engines, etc. The works complete, are estimated to cost not over $80,000.

The old Sharpsville Furnace, at Sharpsville, Ill., has just been blown in after lying idle for two years. The Joliet Steel Co. has made a contract to take all the iron the furnace can produce, and this means a long and steady run. The Douglas Furnace at the same place has also been put in blast. A very valuable deposit of iron ore has been found on the farm of Mr. J. S. Stauffer, in Conewago Township, Dauphin County, Pa., in close proximity to the Colebrook Valley Railroad. A plant of furnaces and stove works will be commenced as soon as possible.—*Boston Commercial Bulletin.*

The New England Shipbuilding Company, Bath, Me., are building a number of vessels, among which, according to the *Industrial Journal*, is a fast steamer, hull and machinery complete, for the Maine Central Railroad, to run on the Mount Desert ferry route, and to be completed for the next season's business. Her dimensions are to be 157 ft. length, 28 ft. width, and 10 ft. depth, and the contract calls for a speed of at least 18 miles an hour. The engines and boilers will be built at the company's iron works, which started on full time the present week, with a large increase of workmen. The engines are to be of the triple-expansion pattern, designed by C. E. Hyde, superintendent of the works.

A syndicate of Eastern capitalists some months ago purchased the old Government arsenal and armory property at Harper's Ferry, Va., made famous by the John Brown raid, and are pushing preparations with all possible dispatch to the end that the improvement of the property may begin in the spring. They expect to utilize the splendid water-power of the Potomac and the Shenandoah, which is estimated at 6,000 to 8,000 horse-power. According to James D. Butt, the attorney for the syndicate, who is on the ground, they hope to turn out manufactured articles, from watches to railroad rails, much cheaper than can be now done elsewhere, even with the new fuel, natural gas. They will open their first factory about July 1, and others as soon as possible thereafter.

Arrangements have been made for the consolidation of Carnegie & Co.'s steel mill at Homestead, Pa., the Lucy furnaces, and the large iron and steel mill of Wilson, Walker & Co. These concerns have dissolved and reorganized under the firm name of Carnegie, Phipps & Co., Limited. The new concern will be the largest iron and steel firm in the country. John Walker will be president, H. P. Smith, secretary, and Wm. H. Singer, treasurer. Extensive repairs will be made at the Homestead works and at Wilson, Walker & Co.'s. Both mills have closed down, and will not resume until the end of the present month. The capital stock is nominally $3,000,000, and large works will shortly be erected. The consolidation is looked upon here as a strong indication of prosperous times in the steel and iron trade during the coming year.

A correspondent of the Lynchburg *Virginian* writing from Roanoke, Va., says: "This community is greatly elated over the certainty of renewed active operations at the Roanoke Machine Works. The superintendent has received instructions to increase at once the force under his control to 800 men. The number lately employed has been but little, if any, over 300, and they have not been fully employed. The company has lately received an order for 19 locomotives and 500 box-cars. This order, together with others previously received, and the necessary repairs for the Norfolk & Western and the Shenandoah Valley rolling stock, will, I am authoritatively informed, occupy the works to the fullest extent of their capacity, which is about 1 200 hands, for the next 12 months, and on full time. The works reopened on the 4th of January, and operations on the new contracts began on the 14th. Other enterprises that have been hanging fire because of uncertainties connected with this leading industry, will now assume tangibility, and the Mountain City will continue to grow and prosper."

The Missouri Malleable Iron Company, St. Louis, Mo., have half of their yearly capacity already under contract, and are contemplating, as a probability, a further enlargement of their moulding floors. Several of their contracts for 1886 are of large proportions and unless the year shall prove unexpectedly disappointing, an extension of their plant will become an imperative necessity. The L. M. Rumsey Manufacturing Company are restoring the building formerly occupied by the Western Union Wire Company, and damaged by fire. They are also preparing to raise their sheet lead and pipe works another story higher. The additional room in both cases will be used in connection with their extensive jobbing and manufacturing business. The sale of John O'Brien & Co.'s property occurred last week. The machinery, building and lot, the last named having a frontage of 96 feet, and an average depth of 112 feet, were bid in by Mr. Wm. P. Smyth, one of the two partners, for $12,400. The stock, including old and new boilers, boiler heads, etc., horses, buggies, etc., were purchased by Mr. O'Brien. The latter gentleman will at once establish himself at 908 and 910 N. Main street, in the building formerly occupied by the Bignall & Keeler Manufacturing Company, for the purpose of continuing the boiler-making business. Prior to the partnership sale he had contracted for considerable new machinery, which he will put in quickly, together with such other parts of his plant as remain to be purchased. Meantime he will make repairs and carry on general operations in a small way. Mr. Smyth will form a joint stock company, and start up the old works at the earliest practical date.—*Age of Steel.*

Machinists' Supplies and Iron.

NEW YORK, Jan. 6, 1886.

The market is as yet very unsettled, and there appears to be mutual consent between buyers and sellers to wait for further developments.

Iron—In American pig the market has been quiet and steady, and without new feature. Large consumers have generally made contracts for their supplies. The outlook is decidedly better than at the same time in 1885. We quote Standard Lehigh and North River brands $18 to $18.50 for No. 1 X Foundry at tidewater; $17 to $17.50 for No. 2, and $16 to $16.50 for Grey Forge.

Scotch Pig—Moderate demand, easier tendency. Coltness, $19.50 to $20; Glengarneck, $18.50 to $19, to arrive; Gartsherrie, $19 to $19.50; Summerlee, $19 to $19.50; Eglington, $17.50 to $18; Langloan, $19.50; Dalmellington, $18.25.

Lead—Market dull. Small dealers ask 4.65c. to 4.70c for spot.

Copper—Market firm; demand light at 11⅝c. for spot Lake, and 11.70c. to 11.75c. for future delivery.

Tin—Dull; moderate transactions; prices fluctuating. Banca, 21⅜c.; Straits and Malacca, 20.75c. cash, for small lots.

Spelter—Dull; refined, 5¾c. to 6c.

Antimony—Hallett's, 8⅝c. to 8¾c.; Cookson's, 9½c.

✻WANTED✻

"Situation and Help" Advertisements, 30 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

Traveler wants engagement to push special tools, manfrs' supplies, etc. Expert, AM. MACHINIST.

Pattern-maker, good general hand, wants job; city or country. Address T., AM. MACHINIST.

Wanted—Good moulders; steady work (none others need apply). Address Lock Box 143, Middletown, N. Y.

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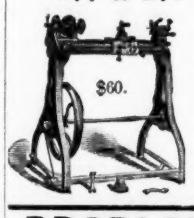

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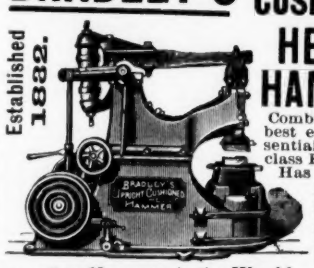

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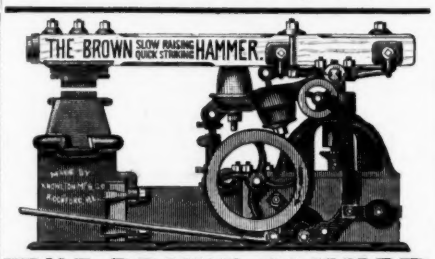

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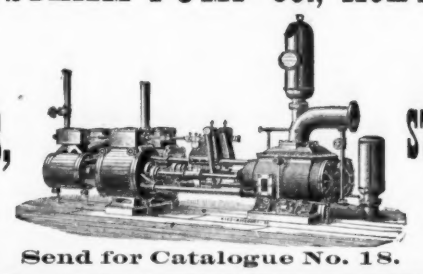

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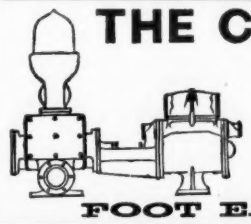

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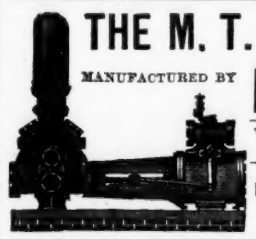

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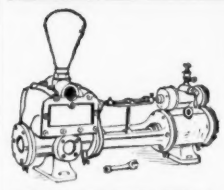

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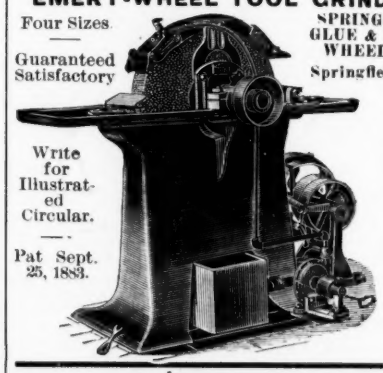

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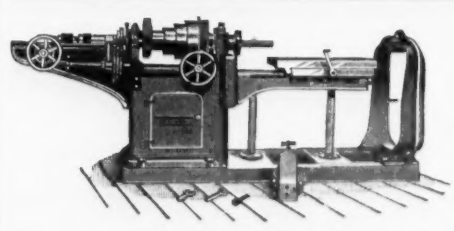

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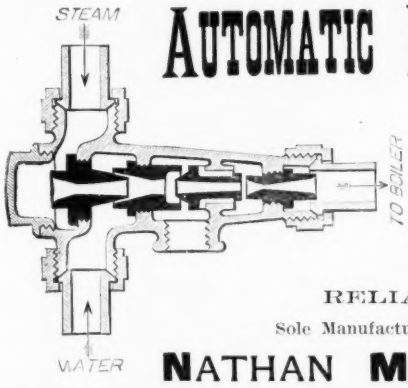

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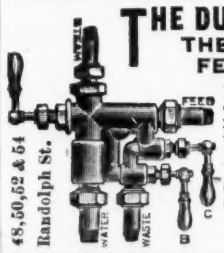

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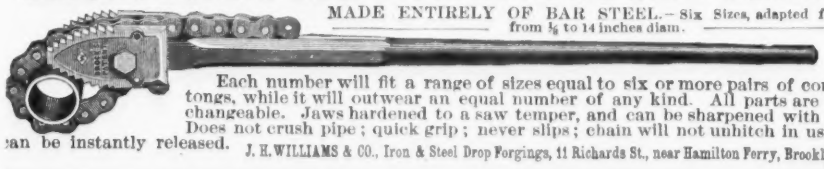

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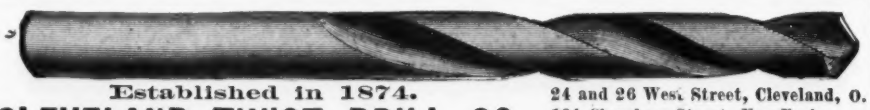

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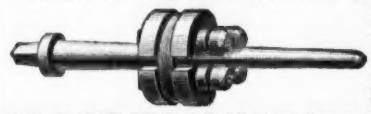

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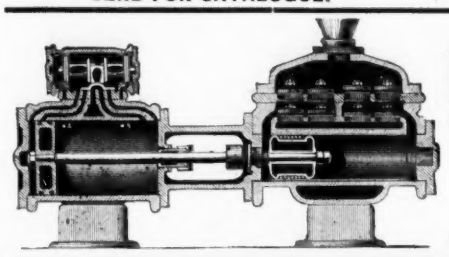

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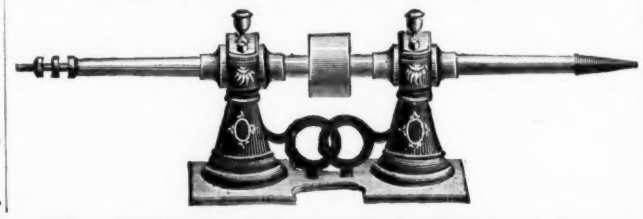

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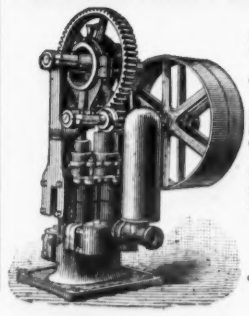

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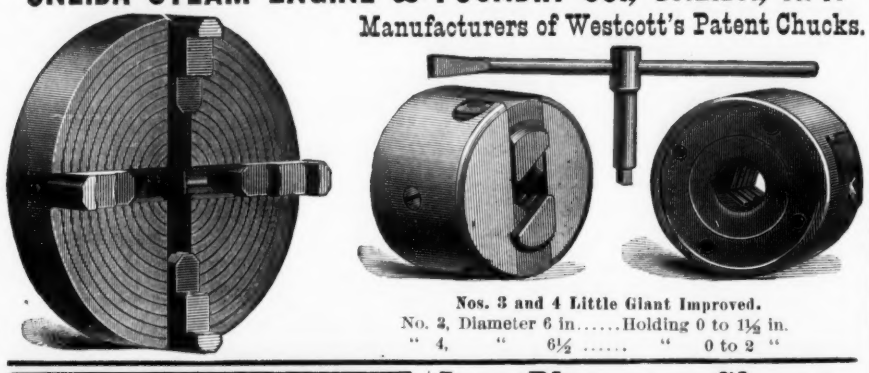

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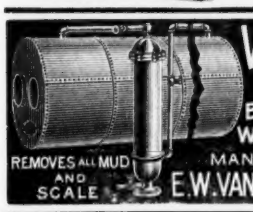

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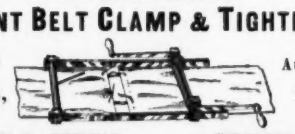

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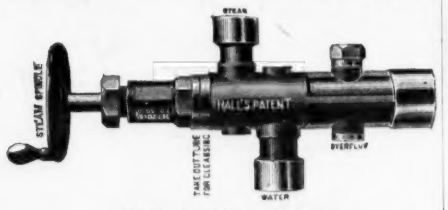

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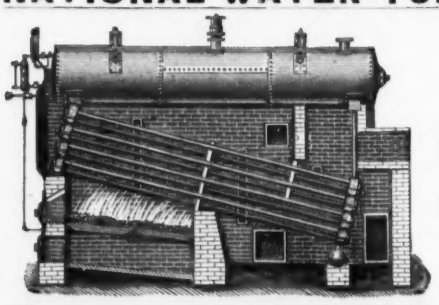

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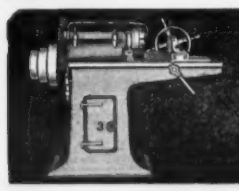

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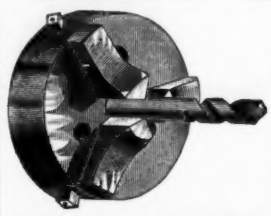

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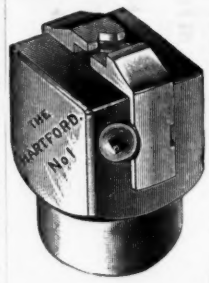

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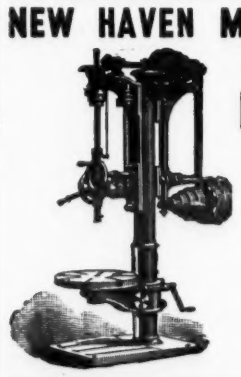

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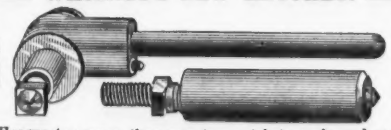

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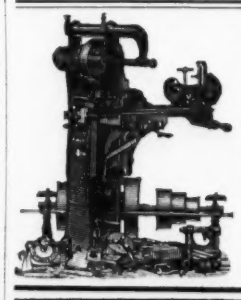

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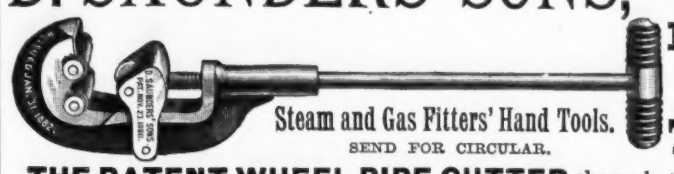

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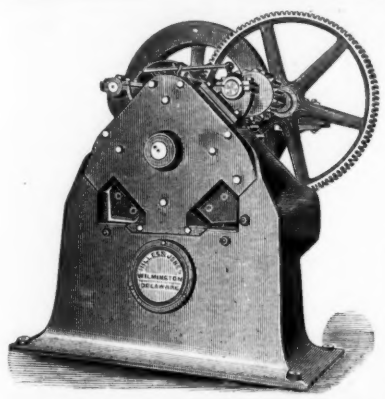

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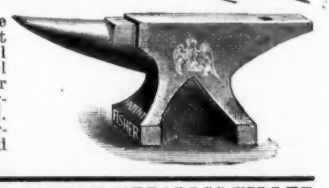

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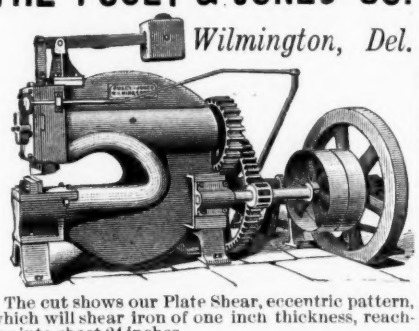

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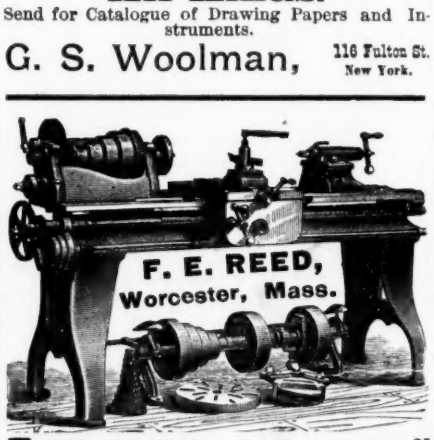

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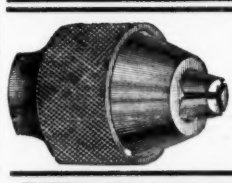

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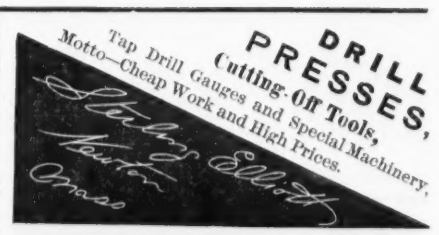

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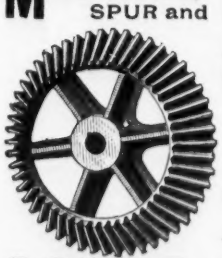

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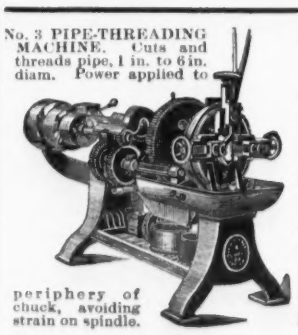

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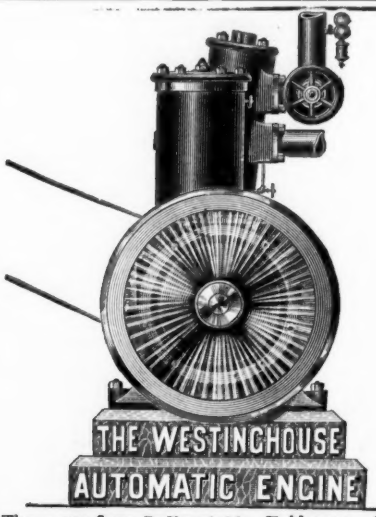

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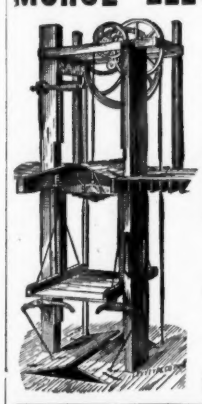

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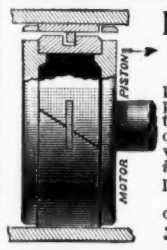

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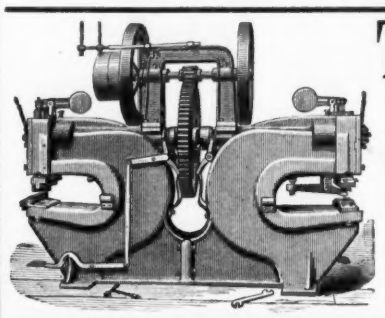

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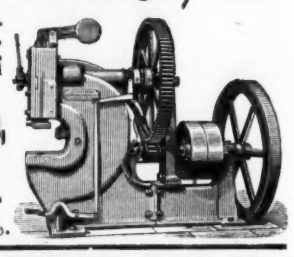

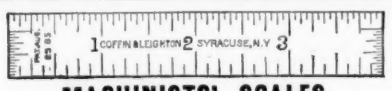

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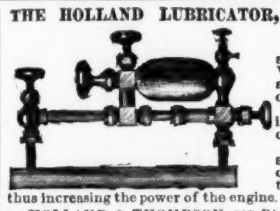

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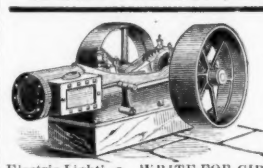

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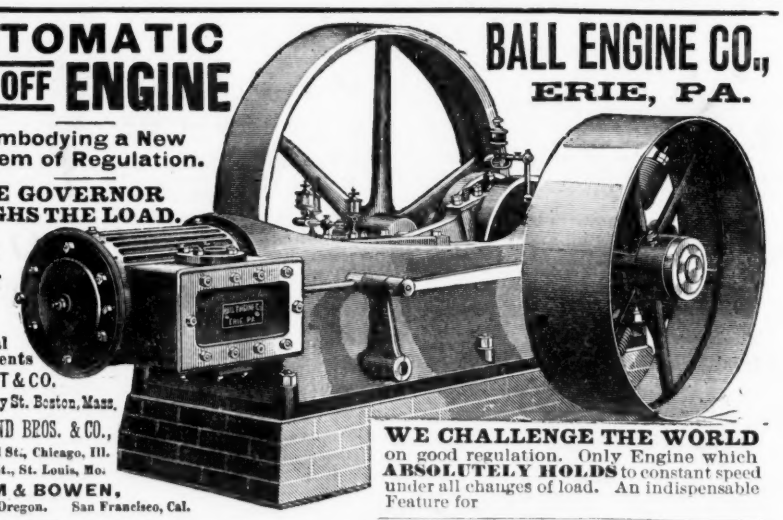

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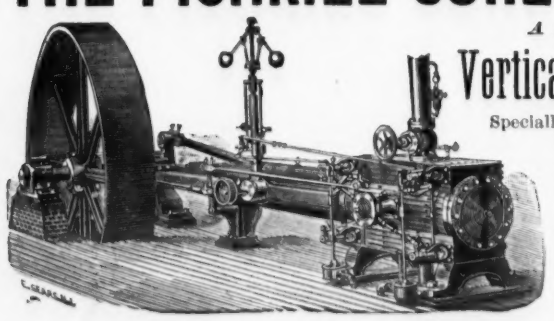

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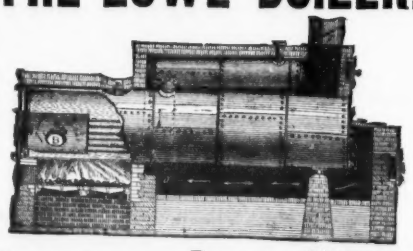

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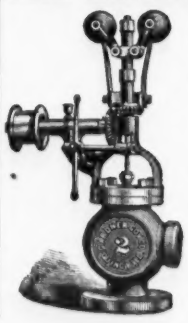

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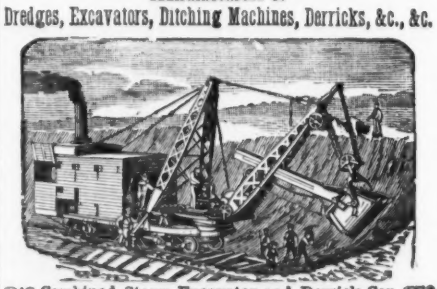

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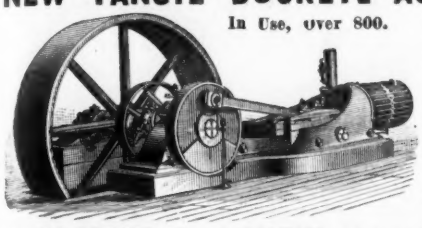

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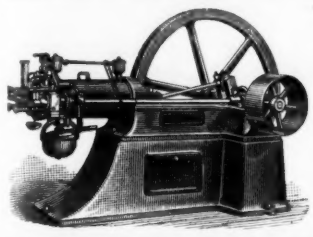

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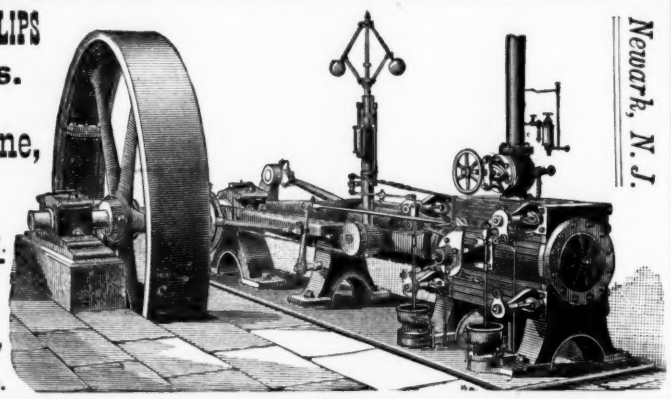

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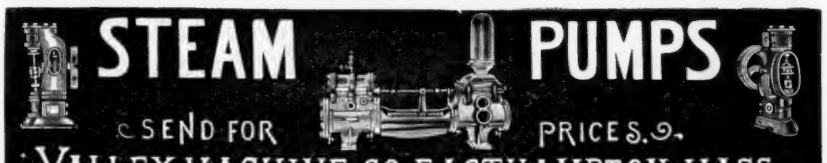

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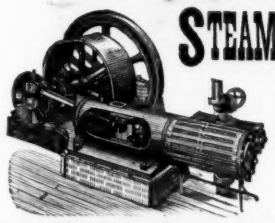

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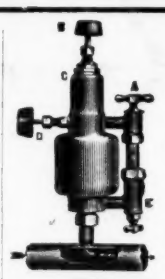

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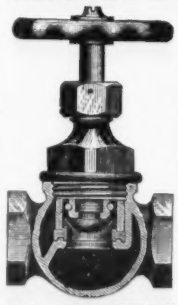

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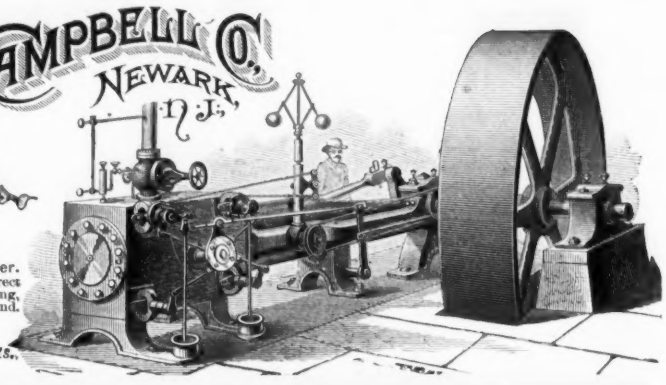

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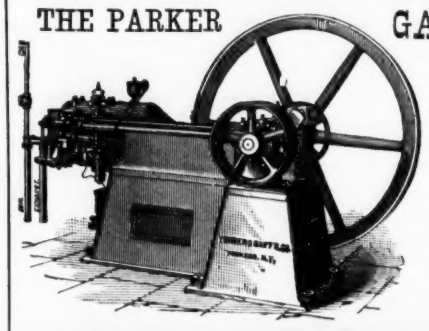

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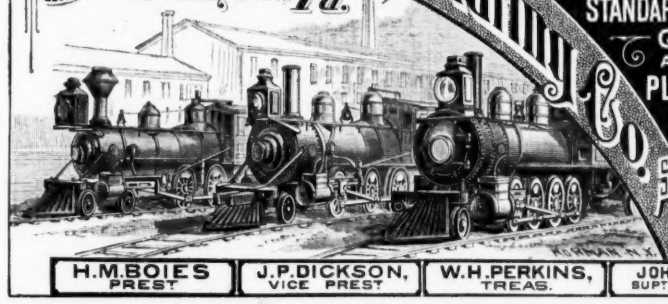

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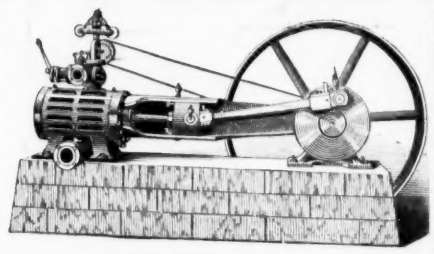

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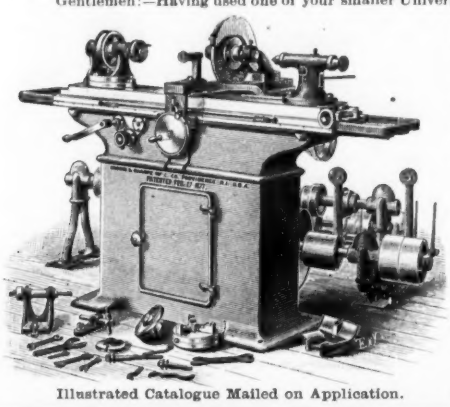

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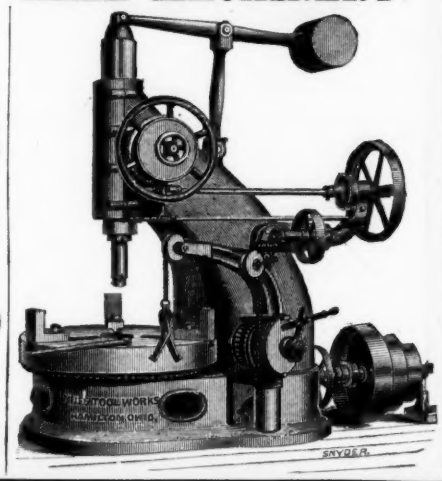

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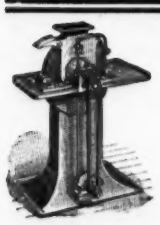

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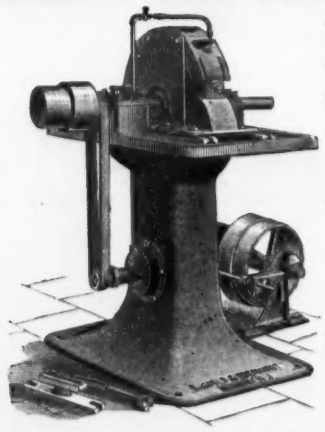

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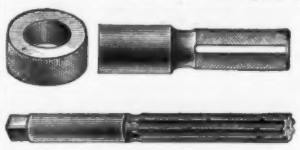

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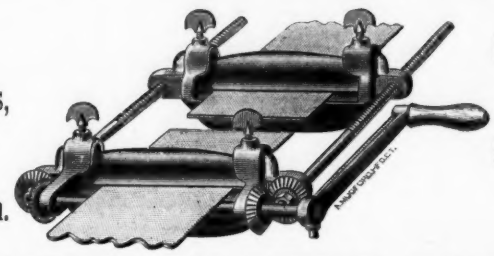

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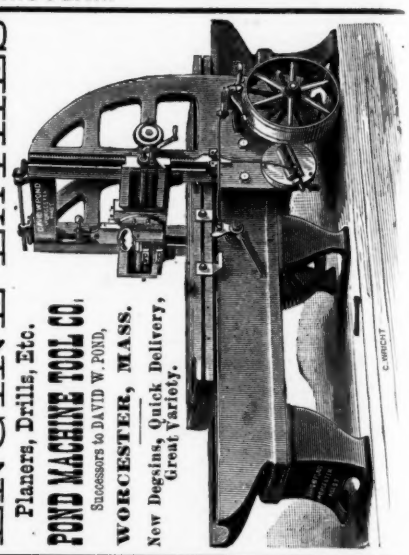

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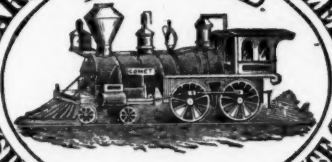

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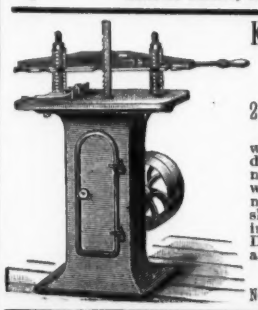

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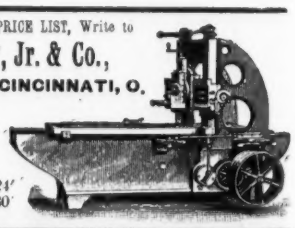

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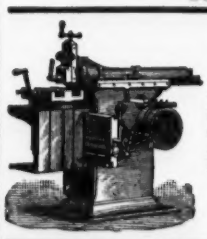

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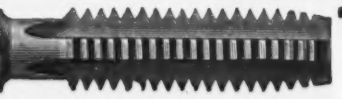

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